Cluster-Based Industrial Development

Kaizen Management for MSE Growth in Developing Countries

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Softcover reprint of the hardcover 1st edition 2014 978-1-137-38469-0

First published 2014 by
PALGRAVE MACMILLAN

Palgrave Macmillan in the UK is an imprint of Macmillan Publishers Limited, registered in England, company number 785998, of Houndmills, Basingstoke, Hampshire RG21 6XS.

Palgrave Macmillan in the US is a division of St Martin's Press LLC, 175 Fifth Avenue, New York, NY 10010.

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ISBN 978-1-349-48100-2 ISBN 978-1-137-38511-6 (eBook)
DOI 10.1057/9781137385116

This book is printed on paper suitable for recycling and made from fully managed and sustained forest sources. Logging, pulping and manufacturing processes are expected to conform to the environmental regulations of the country of origin.

A catalogue record for this book is available from the British Library.

Library of Congress Cataloging-in-Publication Data

Otsuka, Keijiro.
Cluster-based industrial developments : KAIZEN management for MSE growth in developing countries / Keijiro Otsuka, National Graduate Institute for Policy Studies, Japan, Tetsushi Sonobe, National Graduate Institute for Policy Studies, Japan.
pages cm
ISBN 978-1-349-48100-2

1. Small business—Developing countries—Management.
2. Industrialization— Developing countries 3. Economic development—Developing countries. I. Sonobe, Tetsushi. II. Title.
HD62.7.O87 2014
338.9'0091722—dc23 2014028331

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Preface

When we began our project on the development of industrial clusters in East Asia (i.e., Japan, Taiwan, and China) in December 1998, the first question we asked was: *How does the industrial cluster develop?* At that time, we did not know much about the reality of industrial clusters, and we were curious whether there were diverse patterns of cluster development. In order to grasp what has been happening in the industrial clusters, we spent a few weeks conducting informal surveys on the clusters of electronics production near Taipei and machine-tool production in Taichung in Taiwan, a week or so on the garment cluster in Bingo near Hiroshima in Japan, and a few weeks on the dense and diverse clusters in Wenzhou city in China. All of them are, or at least they were, successfully developed industrial clusters. What struck us were the similarities of development patterns of industrial clusters across industries and the three countries: the initiation of a new cluster by traders or engineers based on the imitation of imported products; the quantitative expansion and the formation of the cluster, notably by spinoffs; and the explosive development of the cluster in terms of the improvement of the product quality, enlarged size of enterprise operation, and expanded outlets of products, all propelled by innovations. We reported these findings in our first book, *Cluster-Based Industrial Development: An East Asian Model*, published in 2006.

The next question that immediately came to our minds was: *Why do many clusters develop in Northeast Asia whereas others do not, particularly outside of this region?* Subsequently we conducted case studies in Vietnam, Bangladesh, Pakistan, Kenya, Ghana, Ethiopia, and Tanzania, with a particular focus on industrial clusters producing labor-intensive products, in which low-income countries have a comparative advantage. Such clusters usually consist of micro and small enterprises (MSEs). In the process of identifying appropriate study sites, we happened to find a surprisingly large number of industrial clusters even in very poor countries in sub-Saharan Africa (SSA), which are often formed by spinoffs in a manner similar to the industrial clusters in East Asia. Some clusters (e.g., the garment cluster in Bangladesh) grow spectacularly, whereas others (e.g., the garment cluster in Ethiopia) stagnate. It was obvious to us that the difference arises from the success and failure of innovations. Innovations include both technological and managerial improvements,

which are usually based on imitations from more advanced countries. The most outstanding example is the garment industry in Bangladesh, which has massively introduced improved technologies and management know-how from Korea. Another example is the leather shoe cluster in Ethiopia, which has successfully grown based on learning a great deal from Italy. In our view, this common pattern of development based on learning from abroad is precisely the essence of the "East Asian Model of Development." It was encouraging for us to find that this model worked not only in East Asia but also in South Asia and SSA. These findings are reported in our second book, *Cluster-Based Industrial Development: A Comparative Study of Asia and Africa*, published in 2011.

Having completed more than 20 case studies in various countries in Asia and SSA, we became confident that the industrial cluster is an effective institution for industrial development, that some clusters are stagnant because of the absence of information about innovation or the lack of entrepreneurship, and that such stagnant clusters can be developed if we transfer useful knowledge for innovations from abroad. We also realized that contrary to the image of the "rational" entrepreneur who appears in microeconomics textbooks, entrepreneurs in stagnant clusters looked "irrational," as they simply wait for customers without advertising, do not print their company's name and telephone number on receipts, and their workshops are terribly dirty and disorganized. Observing such poor management, it seems to us that they try to maximize the profit subject not only to known technology but also to known management knowledge. We were also fairly confident that Japanese-style *Kaizen* management will be effective in improving management efficiency, which can potentially lead to basic but practically significant innovations in enterprise management. Since 2007 and in collaboration with the World Bank and the Japan International Cooperation Agency (JICA), we have conducted pilot projects in several stagnant clusters where management training programs are provided for MSEs free of charge. The purpose of this new volume is to test the hypothesis that *such stagnant clusters can be developed if we can transfer useful management knowledge from abroad*, based on the results of management training experiments. Although we do not think that our academic journey has ended now, we believe that we have compiled enough evidence to design an effective strategy to develop industrial clusters in developing countries.

We are heavily indebted to the collaborators of our case studies, including Girum Abebe, John Akoten, M.N. Amin, Berihu Gebrehiwot, Yuki Higuchi, Alhassan Iddrisu, Terrence Kairiza, Yukichi Mano, Aya Suzuki,

H. Nam Vu, and Yutaka Yoshino. We would like to wholeheartedly thank them. We would like to gratefully acknowledge useful comments and suggestions given by Tahir Andrabi, Stefan Dercon, Mulu Gebreeyesus, Takeo Hoshi, Akio Hosono, Hidehiko Ichimura, David McKenzie, Edwin Mhede, Alistair Munro, John Page, James Robinson, Yasuyuki Sawada, Admasu Shiferaw, Go Shimada, John Sutton, Finn Tarp, Samuel Wangwe, and Xiaobo Zhang. We would also like to thank Paul Kandasamy and Yasuko Maeshima for their excellent editorial assistance. Finally we are also grateful to the financial support provided by the Global Center of Excellence Program of the Japan Society for the Promotion of Science (JSPS) and by JSPS KAKENHI Grant Number 25101002.

Tetsushi Sonobe and Keijiro Otsuka
April 2014

1
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, Tanzania, and Vietnam 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 (GDP) 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 has increased steadily over the last four decades. It seems clear that the location of manufacturing centers moved from developed countries in the West, such as the USA, 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,

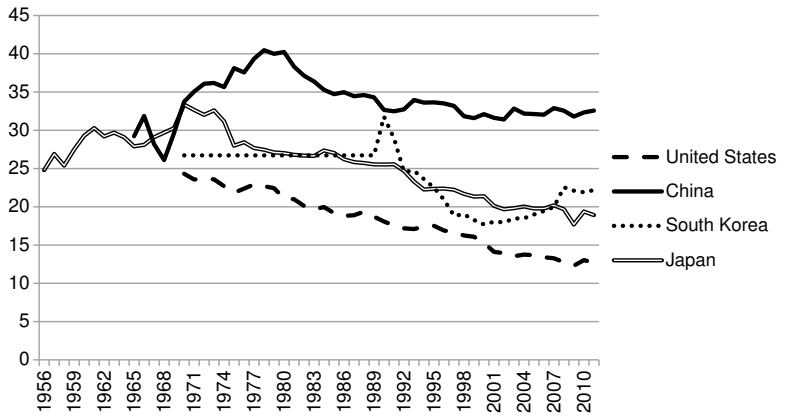

Figure 1.1 Changes in GDP share of manufacturing sector in selected countries
Source: United Nations, http://unstats.un.org/unsd/snaama/introduction.asp.

industrialization in East Asian countries began with the development of labor-intensive, light industries, then 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 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. As the wage rate has been rising sharply in this country since around the turn of this century, light manufacturing industries have been moving away from coastal China, where most industries were concentrated. Since China is a huge economy, small structural changes in this country could mean large changes in many other countries.

The relocation of light manufacturing industries out of China will create an immense opportunity for countries in SSA and South Asia to industrialize, although they have so far failed to do so. It may be true, however, that part of the relocation is directed toward the less industrialized inland areas in China because the dispersion of industrial development occurred after the initial geographical concentration took place in Japan, Korea, Taiwan, and the USA (Glaeser et al., 1992; Henderson et al., 1995; 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 those in 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, for example, 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 the 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 USA. Even now, IT industries continue to be 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 many large industrial clusters in industrialized areas, such as Zhejiang, Guangzhou, and Jiangsu provinces (Long and Zhang, 2011). Two leading industries in Bangladesh, namely, 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 three theories of agglomeration using 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 Entrepreneurship 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; that is, 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 (RCTs) 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 is crucial for inclusive growth.[4] We pay special attention to management, as its importance has been grossly underestimated among researchers and policymakers.

Our basic premise is that learning useful technological and managerial knowledge from abroad is an essential element 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 common-sense, low-cost approach to management. Its goal is to help enterprises attain 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 common-sense 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. The term 5S is named after Japanese words representing the five steps of housekeeping; their romanized expressions commonly begin with the letter *S*. The first is *Seiri*, which means classifying items in the workplace as necessary and unnecessary 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 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 that based on the experiences of innumerable enterprises worldwide, 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 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 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 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 could, however, 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 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 the first time, the enterprise owner must explain to the workers why he or she wants to introduce *Kaizen* and then ask for their cooperation. Otherwise, it will be 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 the 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 the 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 a 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 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 from 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 (defined as value added minus labor cost) of the treatment and comparison firms before and after the training program. Since the 30 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 finds that the treatment firms have adopted the *Kaizen* management practices 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 correlated and 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.

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	$t = 5.1$	$t = 4.5$
Value added after training[a]	75.2	20.7		
Gross profit before training[b]	21.6	12.5	$t = 4.6$	$t = 4.4$
Gross profit after training[b]	67.7	18.3		

[a] Value added is defined here as sales revenue minus the costs of materials and other intermediate inputs including electricity, water, sub-contracting, and transportation.
[b] Gross profit is value added minus labor cost.
[c] Two-tail test of the null hypothesis that DID is equal to zero.
[d] Two-tail test of the null hypothesis that DID 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 PhD dissertation (Gebrehiwot, 2013).

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 in 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 et al. (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 USA.

In recent years, an increasing number of 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 et al. (2014), and Bruhn et al. (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 et al. (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: 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 because, importantly, 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 ten 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 – "Toward 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 attending 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 weeks of classroom training in all the sites, as well as on-site training in the metalwork cluster in Ethiopia and the garment clusters in Vietnam and Tanzania (Chapters 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 multinational 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, the effects 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 that 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 provision of credits and infrastructure.

Part I

Management, Innovations, and Enterprise Growth

2
Innovation and Cluster Development

2.1 Introduction

While policymakers in developing countries are eager to develop industries for job creation and poverty reduction, they are unaware of effective strategies to support industrial development. Surprisingly, neither international development organizations nor donor communities have provided useful recommendations for successful industrial development, even though the World Bank's (2012) *World Development Report 2013* and African Development Bank and OECD Development Centre's (2012) *African Development Outlook 2012*, among others, emphasize the importance of creating jobs through industrial development. In our view, the root cause for such a situation is the inability to identify the major market failures that constrain the development of industries.

Based on a large number of our own case studies as well as a review of the literature, we argue in this chapter that the success or the failure of the development of cluster-based manufacturing industries hinges on the emergence of multifaceted innovations, which encompass technological, marketing, and management innovations. Indeed, we demonstrate that a major difference between stagnant or "survival" clusters and dynamic clusters lies in the absence or presence of multifaceted innovations, rather than in the ways by which industrial clusters are formed. We emphasize that multifaceted innovations may not take place due to market failures arising from imitation or information spillovers and the ignorance of the value of new useful information. Thus, policy interventions are needed to correct such market failures.

In Section 2.2, we show that there are three typical development paths of industrial clusters, while in Section 2.3 we discuss the critically important role played by multifaceted innovations in the takeoff of industrial

clusters. In Section 2.4, we attempt to learn lessons for formulating effective industrial development policy from several successful development experiences of industrial clusters in Asia.

2.2 Three types of industrial clusters

Schmitz and Nadvi (1999), Sonobe and Otsuka (2006), Huang and Bocchi (2008), and Long and Zhang (2011, 2012), as well as many other studies, report that there are a large number of industrial clusters in East Asia, South Asia, and Latin America. Clusters in SSA are reported by McCormick (1999), Oyelaran-Oyeyinka and McCormick (2007), and Sonobe and Otsuka (2011). We believe that industrial clusters producing garments, fabrics, leather shoes, furniture, and simple machinery are much more ubiquitous in developing countries than generally recognized, as evidenced by a large number of case studies (e.g., Cawthorne, 1995; Chari, 2000; Gebreeyesus and Mohnen, 2013; Huang et al., 2008; Knorringa, 1999; Rabellotti, 1995; Schmitz, 1999; Tewari, 1999; Zhang et al., 2011).[1] Since an exhaustive list of industrial clusters in developing countries is not readily available, little is known about their general characteristics. It appears that some of them were created by shifting from related businesses. For example, the major producers of readymade garments in Addis Ababa evolved from small tailors. Learning the production methods of new products and management know-how from state-owned enterprises and cooperatives as well as from foreign direct investment (FDI) is another way to initiate the new business. There are also a few cases in which training by foreign firms and international organizations triggered the establishment of new industrial clusters. Another important way in which an industry emerges was experienced by the garment industry in Bangladesh, which began with the intensive training of Bangladeshi workers in Korea.

We find surprisingly similar patterns of the development of industrial clusters across roughly 20 case studies conducted in Japan, Taiwan (China), China, Vietnam, Bangladesh, Pakistan, Ghana, Ethiopia, Kenya, and Tanzania.[2] More often than not, new industries in developing countries are initiated by pioneering persons who succeed in producing imitations of imported foreign products. Particularly when the pioneer of a new industry is not related to a state-owned enterprise or an FDI, he or she exerts great efforts to find new production methods, sources of materials, workers with desired skills, and marketing channels. Once the new business is established, however, the pioneer receives 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 attracts a swarm of imitators to the industry. Many of them are spin-offs, that is, the former employees of the pioneer,[3] and produce the same low-quality products by using the same low-quality inputs and sell their products on the same local markets as the pioneer. In this way, an industrial cluster is formed, as illustrated by the dotted curve showing the increasing number of enterprises in Figure 2.1. A similar path is followed by industrial clusters in which the initiation of the industry is based on the technology brought by FDIs and state-owned enterprises. Since the profits are reasonably high, for the time being, entrepreneurs are not particularly interested in introducing new ideas and knowledge. Hence, productivity and product quality hardly improve. Still, the cluster expands in terms of the number of enterprises and the total output. This phase of industrial development is termed the "quantity expansion" phase.

As a cluster expands in this manner, 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 enterprises specialize in the production of parts. In other words, the division of labor between manufacturers and traders

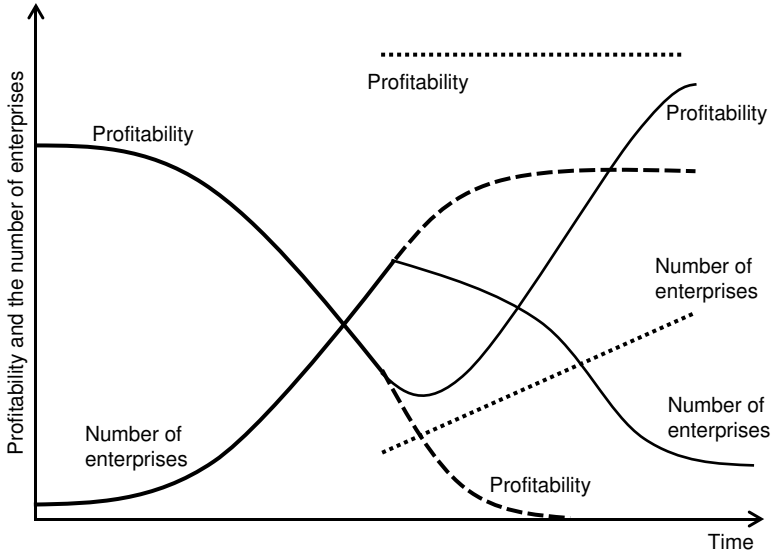

Figure 2.1 Illustrated development paths of survival, dynamic, and jump-start clusters
Source: Adapted from Sonobe and Otsuka (2011, p. 6).

and between assemblers and parts-suppliers increases with the market size (Ruan and Zhang, 2009; Stigler, 1951).

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 of products is not serious because all products and parts produced and transacted in the cluster are of uniformly low quality. Note that the enterprises in the cluster do not exercise any quality control and, hence, no enterprise can maintain exactly uniform quality, but that their products are standard or homogenous in the sense that their products are not differentiated intentionally. The problem of imperfect contract enforcement, such as holdup problems, 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.[4]

As the entry of new enterprises continues, unaccompanied by any improvement in product quality and productivity, the increased supply of their products will eventually lower product prices and profitability. This process, illustrated by the solid curve showing the declining profitability in Figure 2.1, takes place in the subsequent period of the quantity-expansion phase of industrial development. Declining profitability, however, will induce entrepreneurs to seek more profitable products (Aghion et al., 2005), which should be of higher quality and differentiated from the inferior products of other enterprises.

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 innovations. This will lead the cluster to a long-run equilibrium with low profitability, in which a number of small enterprises struggle for survival. Such "survival clusters" of MSEs are common in developing countries and abound especially in SSA.

Many industrial clusters in Asia have succeeded in innovation and follow a path leading to the dramatic development of the industry with a smaller number of much larger enterprises, as illustrated by the solid upward profitability curve and the dotted downward curve showing the number of enterprises in Figure 2.1. The dynamic development phase that begins with successful innovation is termed the "quality improvement" phase. Those industrial clusters which succeed in entering this phase and continue to grow may be called "dynamic clusters."

An increasing number of enterprises attempt to innovate in the dynamic cluster, and some of them further improve production and management practices. Those enterprises undertaking continual improvement will grow steadily, whereas enterprises that fail to keep pace with growing enterprises will be forced to exit the industry or will be merged with growing enterprises. While the number of enterprises in the cluster will decrease as a result of such exits and mergers, the total production value and employment of the cluster will continue to grow, and the improved products will be sold in larger markets, including export markets. To our knowledge, continual improvement is never achieved without 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 enterprises operating within their countries, and an example will be offered in Section 2.4 below. Entrepreneurs in Asia have been keen on learning from the successful experiences of advanced enterprises in neighboring countries. By contrast, the importance of learning from abroad is not clearly recognized in SSA with only a few exceptions.[5]

A question may arise as to whether the cluster can jump-start from the quality-improvement phase, rather than experiencing the quantity-expansion phase, by learning advanced production methods and management know-how from abroad. Our answer is affirmative. As will be discussed later in this chapter, the garment cluster in Bangladesh from the beginning consisted of relatively large enterprises which employed 300 workers or so on average. They exported their products to developed countries and generated large profits because of the intensive initial training they had, which successfully transferred production techniques, marketing methods, quality control, and labor management from Korea to Bangladesh. Such "jump-start" clusters will have a high profitability curve and an upward-sloping curve showing the increasing number of enterprises as illustrated in Figure 2.1.

Although less successful than the case of the garment cluster in Bangladesh, the garment cluster in Dar es Salaam in Tanzania started from scratch through the training offered by the United Nations Industrial Development Organization (UNIDO) in the 1990s.[6] Unlike the garment cluster in Bangladesh, which continued to absorb increasingly advanced knowledge from abroad, this cluster learned skills for

the self-employed garment business only. Advanced knowledge of technology and management has not been provided by UNIDO or sought by enterprises in the cluster until recently, and the cluster has been of the survival type. These examples illustrate the critical importance of sustained innovations for the dynamic growth of industrial clusters and suggest the value of training in introducing new useful knowledge for innovations.

2.3 Multifaceted innovations as key to success

An endeavor to improve the quality of products so as to recover and enhance profitability is far from simple. While an enterprise may be able to improve product quality by using high-quality materials and parts and employing skilled workers, the production cost is bound to increase. Moreover, consumers in developing countries tend to think that local producers cannot produce high-quality products and that if a product is of high quality, it must be foreign-made. Until consumers perceive its improved quality, the new product cannot command a price high enough to cover the increased production cost. Akerlof (1970) points out that branding and quality guarantees are effective countermeasures to this problem. However, few entrepreneurs in industrial clusters are familiar with such countermeasures. Moreover, since brands may be stolen, branding may have to be supplemented with the use of exclusive sales agencies, the operation of their own retail shops in large cities, and other distribution methods (Sonobe et al., 2004). In other words, improved marketing must be an integral part of innovations.

Since the improved products need 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. Otherwise, parts-suppliers will use them in their favor. In addition, to enter the high-quality segment of the market, product quality must be strictly controlled. If these reforms are successfully implemented, product prices can be raised and production can be expanded profitably. As the enterprise size is enlarged accordingly, the management of cash flows, inventory, and labor will assume greater importance. Good management of a large enterprise is a new challenge to the entrepreneurs in the cluster. They may not have any idea of what good management entails. Thus, they may need to study management or hire competent managers or, probably, both.

Thus, multifaceted innovations in technology, marketing, and management are indispensable for transforming a survival cluster into a dynamic

cluster. Entrepreneurs who can carry out multifaceted innovations are either highly educated or are able to make good use of highly educated managers, as it is in no sense simple to carry out a set of innovations more or less simultaneously (Sonobe and Otsuka, 2006, 2011). Our case studies also find that these innovative entrepreneurs took advantage of the availability of a variety of useful 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 defined by Schumpeter (1934), multifaceted innovations are a product of a new "combination" of existing resources. In addition, as in the case of the jump-start cluster, effective learning from abroad is helpful to undertake multifaceted innovations, as advanced countries undertook similar innovations in the past.

2.4 Illustrations from Asia

Having identified the critical importance of multifaceted innovations for the dynamic growth of industrial clusters, we would like to show several examples of such dynamic growth. The first case is the spectacular growth of the motorcycle industry in Japan, which was driven by technological innovations, while the second case is the equally impressive growth of the low-voltage electric appliance industry in China, which was led by marketing innovations. The third case refers to the "jump-start" development of the garment industry in Bangladesh, which was based on the intensive training at the beginning stage of its development. While the education of entrepreneurs is always the key factor underlying the success of multifaceted innovations, the role of education is particularly conspicuous in the recent development of the pharmaceutical industry in Bangladesh, which is discussed as the fourth case below.

2.4.1 The role of technological innovation: The motorcycle industry in Japan[7]

New industries in developing countries begin by imitating imported products from developed countries. The development of the motorcycle industry in postwar Japan was no exception. Just after World War II, primitive motorcycles modeled after imported motorcycles were produced by attaching simple engines (used as small generators for military transceivers) to bicycles. Such simple motorcycles sold so well that at least 127 producers were in operation in 1952, as is shown in Figure 2.2. The rising phase from 1945 to 1952 was associated with the rapid entry

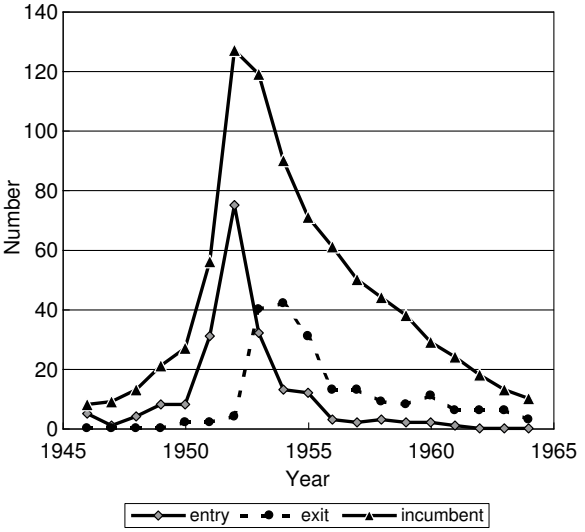

Figure 2.2 Number of operating enterprises, entries, and exits in the motorcycle industry in Japan
Source: Sonobe and Otsuka (2006, p. 91).

of new enterprises and the explosive growth of motorcycle production. The technology was so simple that imitation was easy and rampant. Initially, motorcycles were produced in Tokyo and Osaka, but the industrial cluster was formed in Hamamatsu City located between Tokyo and Nagoya. This period was the quantity-expansion phase of the Japanese motorcycle industry.

Among the most important technological issues in motorcycle production is the improvement in the engine quality. Following the formula developed by Taylor (1960), Yamamura et al. (2005) compute the engine quality index using the exhaustive collection of the catalogues of new motorcycle models.[8] Figure 2.3 shows the average quality of engines by surviving and exiting enterprises. It is clear that the average index did not increase until the mid-1950s, and that the average index rose steadily after that. These changes in the engine quality correspond to the rapid decrease in the number of new entrants in 1953 and 1954, the sudden increase in exits in 1953, and the subsequent decrease in the number of incumbents, as shown in Figure 2.2. The mid-1950s was the beginning of the quality-improvement phase of this industry. Meanwhile, Japan became the largest producer of motorcycles in the world in the late 1950s, surpassing European countries. In subsequent years, the number

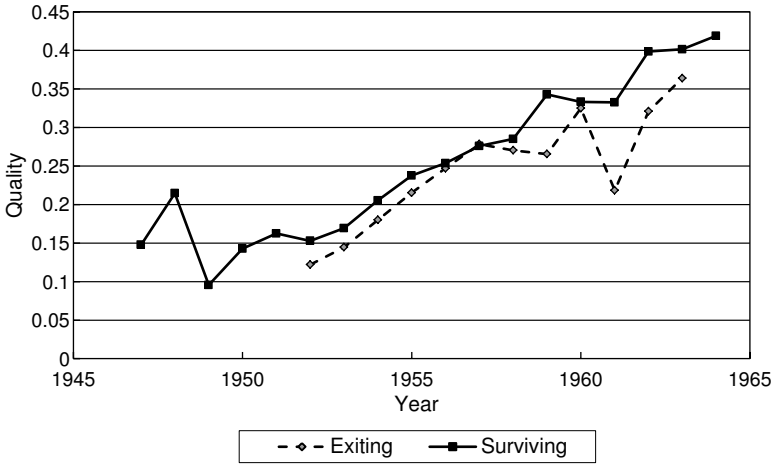

Figure 2.3 Average quality of engines by surviving and exiting enterprises in the motorcycle industry in Japan
Source: Sonobe and Otsuka (2006, p. 92).

of producers decreased drastically and eventually, only the four giant enterprises—Honda, Yamaha, Suzuki, and Kawasaki—remained.

Once the industry entered the quality-improvement phase, the average size of enterprises increased geometrically: it tripled from 1950 to 1956, and increased 15 times from 1956 to 1962. The scale of production by Honda was five to ten times as large as the average. Therefore, not only the quality of competition of the products but also the competition toward the efficient management of large-scale production became intense among motorcycle enterprises in Japan in later years. In short, there is no question that technological innovations as well as improved management of large organizations were the engine of growth of this industry.

2.4.2 The role of marketing innovations: The electrical-fittings industry in China[9]

When the economic reform started in 1978 in China, people in Wenzhou, a now industrialized city in Zehjiang Province, were destitute because the city was endowed with arable land but was densely populated, according to the city officials that we interviewed. Few state-owned enterprises were set up in this city because of its geographic

proximity to Taiwan. The township and village governments in the city could not afford to establish collective township and village enterprises (TVEs). In the early 1980s, however, a large number of poor farmers, who had the tradition of peddling miscellaneous low-quality, handmade goods, such as garments and footwear, to major cities in China, emerged as small-scale enterprises, disguising themselves as collective TVEs or "wearing red caps." Many industrial clusters formed spontaneously in townships in this city. Among them is a cluster of producers of electric fittings, such as switches, fuses, circuit breakers, light fixtures, and related appliances in a township in Yueqing City, which is a lower-level city within Wenzhou.

The managers of long-established enterprises in this cluster told us that an epoch-making event was the establishment of a marketplace for various metal products and materials by the government of Yueqing City because it reduced drastically the difficulties in procuring raw materials and finding buyers for their products, and allowed producers to obtain information from traders on what products were selling well in remote but large cities. The drastic reduction in search costs and the spillovers of valuable market information helped incumbents and attracted new entrants, who were farmers, factory workers, and traders. As shown in Table 2.1, the number of new enterprises that started production in this cluster increased significantly after the construction of the marketplace in the early 1980s.[10] According to our interviews with enterprise managers in other clusters producing garment, footwear, and

Table 2.1 Characteristics of enterprise founders in the electric appliance industry in Wenzhou, China

	Before 1980	**1981–1985**	**1986–1990**	**1991–1995**	**1995–2000**
No. of enterprises	4	32	30	36	10
Years of schooling	8.0	9.8	10.0	10.5	10.9
Occupation (%)					
Farmers	50	13	7	3	0
Factory workers	0	25	17	17	10
Traders	25	25	43	64	50
Engineers	0	3	13	6	0
Managers	0	9	10	6	10
Others	25	25	10	6	30

Source: Sonobe and Otsuka (2006, p. 141).

Table 2.2 Basic production statistics in the electric appliance industry in Wenzhou, China, in 1990, 1995, and 2000[a]

	1990	1995	2000
Number of enterprises	66	102	112
Number of independent enterprises	66	96	73
Sales revenue	320.4	964.1	9,525.7
Value added	123.7	375.8	3,671.4
Number of employees	46.7	104.1	338.3
Capital stock	372.0	983.9	7,922.1

[a] Production and employment sizes reported are averages of the existing sample enterprises in each year. Although some of the sample enterprises had subsidiaries, the numbers shown here do not include subsidiaries. The data on enterprise sizes refer only to the independent enterprises. Values are in terms of the prices in 2000 as a base and measured in 10,000 yuan. The deflator is the ex-factory price index for the electric machinery and equipment industry compiled by the Statistical Bureau of Zhejiang Province (*Zhejiang Statistical Yearbook*, various years).

Sources: Zhejiang Statistical Yearbook, various years and Sonobe and Otsuka (2006, p. 142).

cigarette lighters in Wenzhou, their clusters experienced the quantity-expansion phase in the same manner.

Because of its long tradition of handicrafts and commerce, Wenzhou was endowed with substantial human capital in the form of latent mercantile skills when the economic reform began. Zhang (2001) argues that the active out-migration of Wenzhou peddlers and artisans has contributed to the formation of Wenzhou markets in various large Chinese cities and commercial networks between Wenzhou and those cities. Thus, the Wenzhou model of development includes the network of Wenzhou traders across China as an important ingredient, and this model of development may not be replicable in countries or regions without such networks. Nonetheless, rural–urban marketing networks are not special to Wenzhou but have been created through migration and helped the development of rural industries in other parts of East Asia as well (Otsuka, 1998).

Table 2.2 reports the changes in the number of sample enterprises and their average operation size. In the late 1990s, enterprise groups were formed through mergers in many industries in China.[11] Of the 112 sample enterprises, 28 were registered as groups by 2000, and the largest group had about 70 subsidiaries. Reflecting the formation of enterprise groups, an increasing number of sample enterprises became absorbed in groups as subsidiaries; the number of subsidiaries in the sample was zero in 1990, 6 in 1995, and 39 in 2000.[12] At the same time, a large number of

enterprises left the industry in the late 1990s because their management was too inefficient to be reformed. As a result, the number of independent enterprises as opposed to subsidiaries in the sample increased from 66 to 94 in the early 1990s and decreased to 73 in the late 1990s.

The moderate decrease in the number of enterprises in the late 1990s was associated with the drastic expansion of enterprise size, as shown in Table 2.2, which is in sharp contrast to its moderate growth during the first half of the 1990s. The driving force of the explosive expansion in the sizes of the enterprises and the cluster as a whole is the upgrading of product quality and improved marketing. Quality improvement can be traced back to the mid-1980s, when two partners founded an enterprise with the novel idea of shipping products only after quality inspection, eliminating all defective products. However, the impact of their quality inspection was limited because buyers could not distinguish their inspected products from the other producers' uninspected products that were passed off as having been inspected. To avoid the problem of being intermingled with uninspected products, innovative enterprises began to use brand names and developed new marketing channels using their own retail shops and sales agencies which dealt only with their products.

As Table 2.3 indicates, the importance of these new marketing channels increased throughout the 1990s, whereas the marketplace and local traders declined in importance, especially in the late 1990s. The largest

Table 2.3 Proportion of engineers, the number of subcontractors, and marketing channels in the electric appliance industry in Wenzhou, China[a]

	1990	1995	2000
Composition of marketing channels (%)			
Local wholesale market	23.5	20.4	3.6
Wenzhou traders	26.5	23.8	5.7
Sales agencies	22.0	30.7	50.6
Own retail outlets	9.5	12.6	27.1
Other channels	18.5	12.5	13.0
Proportion of workers that are engineers (%)	1.5	2.7	4.2
Number of parts-supplying subcontractors	0	2.8	34.8

[a] The proportion of workers that are engineers is a weighted average with the share of each enterprise's employment in the total employment of the independent enterprises as weights. The composition of marketing channels is a weighted average with the ratios of each enterprise's sale to the total sales of the independent enterprises as weights.

Source: Sonobe and Otsuka (2006, p. 143).

enterprises had as many as 800 sales agencies throughout China by the late 1990s, even though these enterprises put higher priority on the development of their own retail networks. They solved the agency problem arising from the use of sales agencies by means of local community ties, which was an effective solution because almost all of their sales agencies are merchants from Wenzhou who had settled in large cities earlier. Thus, the enterprises in Wenzhou took advantage of the tradition of out-migration to lower the agency cost.

To improve product quality further and to develop new products, the enterprises hired an increasing number of engineers relative to the enterprise size. Thus, the percentage of employees who were engineers increased steadily in the 1990s as shown in Table 2.3. The enterprises also strengthened their relationship with capable and reliable suppliers to secure high-quality parts. In the 1990s, the "arm's length" transactions of parts were rapidly replaced by more intimate and longer-term subcontracting transactions (see the bottom of Table 2.3).

Table 2.4 shows the increasing proportion of enterprises adopting new marketing strategies. An increasing number of enterprises applied for a certificate of national standard or international standard—granted by the central government body to an individual product if it satisfies the appropriate quality standard—because it helped to convince consumers of the high quality of the product. As a brand name is established, mass selling becomes easier, and a greater number of consumers experience the high quality of the product, which in turn improves the brand image. The formation of an enterprise group through mergers was a way to take advantage of such scale economies. The first enterprise to adopt these new market strategies was also the first to form an enterprise group. In this sense, this enterprise is an innovator. It is also worth

Table 2.4 Proportion of enterprises adopting new marketing strategies in the electric appliance industry in Wenzhou, China (%)[a]

	1990	1995	2000
Full-scale use of sales agencies	12.9	42.7	56.0
Use of brand name	50.0	72.9	98.6
Certification of national standard	43.5	72.9	91.8
Certification of international standard	4.8	15.6	54.8

[a] The table reports the proportion of sample enterprises adopting the designated strategy. This sample does not include subsidiaries.

Source: Sonobe and Otsuka (2006, p. 144).

emphasizing that the manager of this enterprise was a former salesman. This observation is consistent with the fact that the former traders and salesmen actively entered into this industry, as reported in Table 2.1. In short, the series of marketing innovations were the major driver of the spectacular growth of this industry, and these innovations were supported by the local government policies that established the marketplaces and issued the quality certificates.[13]

2.4.3 The role of training: The garment industry in Bangladesh[14]

The high performance of the garment industry in Bangladesh is now well known throughout the world. Since the late 1980s, the number of firms and that of their direct manufacturing employees have increased rapidly, as shown in Figure 2.4. In the 2000s, the industry accounted for as much as 75 percent of the country's exports. As of 2010–2011, as many as 3.6 million workers were employed, and female workers accounted for 80 percent. The vast majority of garment firms in this country are concentrated in Dhaka and its neighborhood, forming a gigantic cluster.

In the 1970s, however, Bangladesh was one of the poorest countries in the world and had no modern garment factories. Countries with a high population density like Bangladesh are supposed to have a comparative advantage in labor-intensive industries like the garment industry.

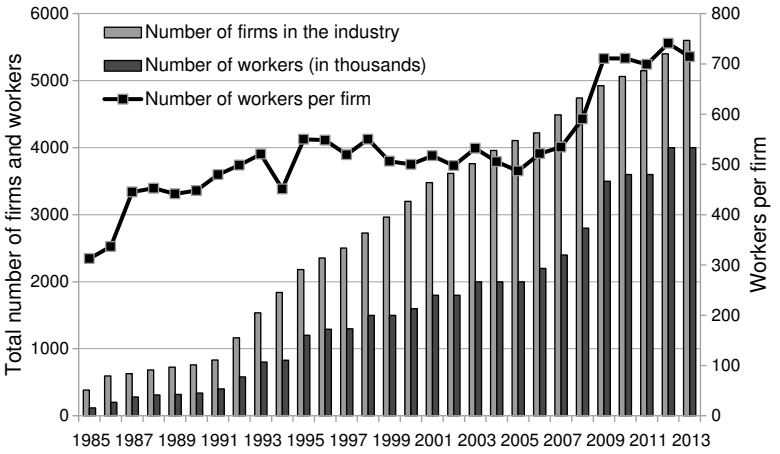

Figure 2.4 The number of firms, the number of workers, and the average number of workers per firm in the garment industry in Bangladesh
Source: Bangladesh Knitwear Manufacturers and Exporters Association (2012).

Why did the modern garment industry not exist in Bangladesh until the end of the 1970s, and why has it grown fast since then? In our view, nothing is more illuminating than the development experience of the garment industry in Bangladesh in understanding the role of training in establishing new industry and sustaining its growth.

Desh Ltd. of Bangladesh sent 130 newly recruited educated employees to the factory of its partner, Daewoo Corporation of the Republic of Korea, for training in order to initiate export-oriented garment production in Bangladesh in 1979. Both sides were motivated because Desh had no experience of producing and exporting garments and because Daewoo needed a manufacturing site from which it could continue to export its products to the US market while avoiding the voluntary export restraint imposed by the US government. Desh's 130 workers received an eight-month intensive training course covering diverse topics from sewing skills to factory management, quality control, and international procurement and marketing. After returning to Bangladesh, they operated the Desh factory with the help of Korean experts and succeeded in exporting products through Daewoo's export channels.

Within a few years, however, almost all the trainees had left Desh to start their own garment businesses. Some of them joined new garment factories established by affluent businessmen, while others founded trading houses, which have contributed to the proliferation of garment manufacturers by providing a variety of valuable services including international procurement and marketing, making samples, and design reengineering to new manufacturers. Observing Desh's profitable start followed by the success of ex-Desh workers, wealthy families invested actively in this industry and highly educated people entered massively into the garment business. As a result, the size of the garment enterprises has been quite large from the beginning; the average employment size was 300 workers in the 1980s and 700 workers in 2005. That is why the development of this cluster falls in the jump-start type illustrated in Figure 2.1.

Learning from abroad continued. Some entrepreneurs participated in training programs in Singapore, Japan, and Europe. Garment enterprises in newly industrialized countries in East Asia began operating in Bangladesh, thereby providing on-the-job training for educated Bangladeshi managers. Thus, many Bangladeshi traders and manufacturers had work experience in garment trading and production, including the experience of working at joint ventures, before starting their own businesses. Such training and work experience in marketing and management, as well as the high educational level of executive

managers, are the major factors explaining the high growth performance of this cluster.

The development experience of the garment industry in Bangladesh provides prima facie evidence that managerial and technological capabilities can be fostered in an industry in a sustained manner by learning from abroad through training and work experience, if educated people are available to the industry. It is also clear that it does not fully pay for private enterprises to invest in the training for the acquisition of new knowledge because the benefits later on spillover to other enterprises, causing adverse impact to the same private enterprises who originally invested. Indeed, the intensive training offered by Desh-Daewoo was a mistake for them, even though it was immensely beneficial for the society. Clearly, this gap between social and private benefits from acquiring new knowledge calls for deliberate industrial policy.

2.4.4 The role of education: The pharmaceutical industry in Bangladesh[15]

In 1982 when the National Drug Policy was implemented, the pharmaceutical industry in Bangladesh had only micro enterprises producing folk medicines and a small number of small-scale subcontractors for multinational enterprises. As is shown in Figure 2.5, however, the drug

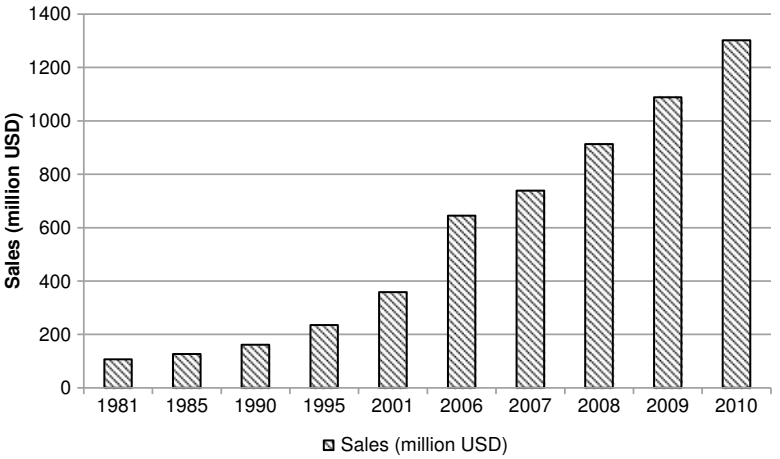

Figure 2.5 Drug production in Bangladesh, 1981–2010
Sources: (a) For the years 1981, 1985, and 1990 – Directorate General of Drug Administration (DGDA), Bangladesh (cited in Chowdhury, 2010, p. 99), (b) for the year 1995 – IMS Health (2012), and (c) the remaining data are from our own survey in 2011.

production in this country, which is mostly concentrated in Dhaka and its neighborhood, has increased rapidly over the last three decades. Since this industry seems to be a capital-intensive and high-tech industry, one may wonder how it can be developed in a low-income country such as Bangladesh. The short answer is that the pharmaceutical industry in this country specializes in the production of generic drugs, which is neither capital-intensive nor high-tech by international standards. All of the active ingredients used in this industry are imported from abroad, and the production processes other than producing active ingredients are not technologically difficult. Still, compared with, say, garment production, generic drug production is science- and skill-intensive and capital-intensive.

One might think that the phenomenal growth of this industry was led by multinational firms. Actually, multinationals dominated the country's market for drugs earlier, but they have been marginalized since the 1980s. Table 2.5 shows the names and ownership types of the ten largest drug firms in terms of sales in the Bangladesh market in 1985 and 2011. While most of the top ten firms in 1985 were the subsidiaries of renowned multinationals, these days all the top ten firms are domestic firms owned and operated by Bangladeshi capital and managers. At present, the multinationals' local production accounts for only 10 percent of the total drug consumption in this country. Thus, it is not an

Table 2.5 Top ten pharmaceutical firms in Bangladesh in 1985 and 2011

	Top 10 firms in 1985		**Top 10 firms in 2011**	
	Firm's name	**Ownership type**	**Firm's name**	**Ownership type**
1	SQUARE	Local	SQUARE	Local
2	BPI (MAY BAKER)	MNC[a]	INCEPTA	Local
3	GLAXO	MNC	BEXIMCO	Local
4	OPSONIN	Local	OPSONIN	Local
5	PFIZER	MNC	RENATA	Local
6	FISONS	MNC	ESKAYEF	Local
7	GONOSHASTHYA	Local	ACI	Local
8	MSD	MNC	ACME	Local
9	CIBA GEIGY	MNC	ARISTOPHARMA	Local
10	HOECHST	MNC	DRUG INT'L	Local

[a] MNC stands for multinational company.

Source: Calculation by Amin and Sonobe (2014) based on the data from IMS Health (2012).

exaggeration to say that Bangladesh has a comparative advantage in this industry.

The National Drug Policy promoted import substitution by prohibiting multinationals from selling drugs that do not need high-tech production, such as antacids and vitamins, restricting the import of substitutes for locally produced drugs and inputs, and prohibiting multinationals without any production facilities in Bangladesh from marketing their products produced by local firms on a toll-manufacturing basis. The policy induced the massive shift of managers, engineers, and skilled workers from the multinational companies to local firms.

The reallocation of human resources accompanied the transfer of technology and management know-how from multinationals to local firms. Note, however, that technology transfer from multinationals to local firms is relatively uncommon according to a number of empirical studies of FDI in developing countries (e.g., Aitken and Harrison, 1999; Kokko, 1994). The reason why the technology transfer was successful in the pharmaceutical industry in Bangladesh seems to be because those who moved from multinationals to local firms were highly trained experts with advanced degrees in pharmacy, biotechnology, and related areas of study and because many of them held important positions in multinationals.

According to Table 2.6, the average schooling of entrepreneurs in the pharmaceutical industry as a whole is 16 years as of 2011 and many of them possess postgraduate degrees including some foreign degrees. Before becoming owners or executive managers, they had work experience in production and sales activities and some of them had worked for pharmaceutical multinationals and received training abroad. Local firms that employ highly educated and experienced managers and specialists and that learn from multinationals tend to grow fast and become large.

Table 2.6 Entrepreneurs' educational and occupational backgrounds in the pharmaceutical industry in Bangladesh in 2010

Average years of schooling	16.0
% entrepreneurs with postgraduate degree	65.5
% entrepreneurs with bachelor's degree	27.0
% entrepreneurs with foreign degree	21.6
Years of prior experience in pharmaceutical production	3.8
Years of prior experience in pharmaceutical sales activities	5.2
% entrepreneurs with prior work experience at a pharmaceutical MNC	20.3
% entrepreneurs who have received training abroad	23.6

Source: Amin (2013).

Table 2.7 Pharmacy education in Bangladesh, 1964–2011

	1964	1985	2000	2011
Number of universities with a pharmacy department	1	2	7	27
Number of approved seats[a]	20	40	450	2,267
Types of universities (public/private)	Public	Public	Public = 4 Private = 3	Public = 6 Private = 21

[a] Number of approved seats means the total maximum number of students permitted to be accepted by the universities.

Source: Bangladesh Pharmaceutical Society. http://www.bps-bd.org/university/pharmaeducation.html (accessed October 17, 2011).

Surprisingly, Bangladesh initiated pharmacy education at the undergraduate level as early as 1964 with 20 students at the University of Dhaka. As shown in Table 2.7, the opportunity for pharmacy education has been expanding rapidly in Bangladesh. In 1969, the University of Dhaka started a master's program in pharmacy. In 2003–2004, the faculty was expanded and divided into three departments (i.e., Department of Pharmaceutical Technology, Department of Clinical Pharmacology, and Department of Pharmaceutical Chemistry), each conferring master's and doctoral degrees. Currently, there are six public universities and 21 private universities offering undergraduate and graduate courses in pharmacy with a total of 2,267 approved seats. There is no doubt that such massive investment in the education of pharmacists has conferred a comparative advantage in the drug-production industry in this country.

Without the government's policies on drug production, however, such a comparative advantage would have remained a mere potential. There is no integrated world market for drugs since the market is associated with a composite of market failures, including indivisibility due to the high research and development costs of new drugs, product differentiation, and asymmetric information about the quality and effectiveness among pharmaceutical firms, medical doctors, and patients. As a result, drug prices can be exorbitantly high, and they tend to be higher in countries with little domestic production of drugs than in those countries with massive domestic production. Thus, the import substitution policy offered lucrative business opportunities for the highly educated potential entrepreneurs to initiate the local production of drugs.

2.5 Conclusions

This chapter attempted to demonstrate the importance of innovations as a major engine of the dynamic growth of industrial clusters. Indeed, examples abound of clusters struggling for survival in the absence of innovations. In contrast, dynamic clusters grow owing to the continuous flow of innovations in production technology and management. Our case studies in the past including the ones discussed in this chapter indicate clearly that it is not sufficient to improve the quality of products alone in order to raise profitability. They need marketing innovations because innovative entrepreneurs must convince consumers of the high quality of their products. They also need management innovations because they must maintain high product quality even after they start mass production.

Due to the complexity of such multifaceted innovations, the education of entrepreneurs is important for innovations. It is also worth emphasizing that improved management is an integral part of multifaceted innovations. Indeed, superior managers can employ technical experts to carry out technological innovations. Another important observation is that entrepreneurship can be acquired by learning from abroad through training and work experience at multinational companies. Thus, the basic tenet of this book is that *entrepreneurship can be fostered by management training to transfer advanced knowledge from abroad so as to stimulate multifaceted innovations*.

3
Management and Innovations[1]

3.1 Introduction

Until recently, it was generally believed that the acquisition of technological capability through technology transfer is essential to industrial development in developing countries, as manifested by such well-known works as Pack and Westphal (1986), Lall (1992), and the immense literature on technology spillovers from multinational firms to local firms (e.g., Aitken and Harrison, 1999). These studies, however, seldom highlighted managerial capability although it was not completely neglected. Yet, increasingly the emphasis has been shifting from technology to management. For example, in their often-cited paper, Bruhn et al. (2010) argue that the capital missing in developing countries is managerial capital, whereas they mention technological progress and innovation only once in the paper. A balanced view on managerial and technological capabilities is missing in this literature.

This chapter attempts to narrow this gap in the literature. It begins by clarifying the meanings of managerial and technological capabilities by developing a simple model. We then argue that although both types of capabilities are indispensable for enterprise growth and industrial development, managerial capability should be increased in advance of or at least in tandem with attempts at technological upgrading, and not the other way around. We illustrate these points by reviewing some of the case studies of industrial development that we conducted earlier. While doing so, we discuss what determines the success or failure of an industry in increasing managerial and technological capabilities sustainably. From this discussion, two major determinants emerge: one is human capital, which can be acquired through schooling, and the other is learning from abroad.

There are many excellent studies of local firms' learning from multinational firms operating in their country and learning from their export markets. By contrast, this chapter looks at those firms with lower levels of managerial and technological capabilities than would be required to transact with and learn from multinationals. How can they reach a level of capability sufficient to attract foreign direct investments to their locality, enter into contacts with multinationals, or make inroads into foreign markets? We argue that market failure problems relating to the acquisition of managerial and technological capabilities call for the public provision of training programs. Although the randomized controlled trials of management training have not yet established that management training improves the business performance of treated firms, we argue that there are good reasons for us to be optimistic about management training. It is true that the public provision of management training cannot cover all the existing firms and new firms, large and small, formal and informal, in developing countries. This is why a strategy for the dissemination of management and technological knowledge should be developed. This chapter attempts to provide some food for thought regarding this issue.

Section 3.2 develops a model of the firms with a view to clarifying what we mean by managerial and technological capabilities. Section 3.3 reviews some case studies of industrial development in Bangladesh, China, Vietnam, and Ghana. Section 3.4 reviews the assessment of some management training programs and discusses issues relating to the dissemination of managerial knowledge. Finally Section 3.5 discusses some implications of this study.

3.2 Managerial and technological capabilities

3.2.1 A simple model of the firm

Some business consultants measure the improvement of management practices by the extent of reduction in the variance of productivity (e.g., Deming, 1986). Following their lead, our model equates the quality of management with the extent of this variance. While managers perform diverse functions in reality, suppose for simplicity that the manager's role is to keep the variance low. Consider a firm producing a single product and taking the market price of the product, p, as given. Its production function is $Q = F(L)$, where Q is output and L is labor input. The production function gives the maximum output that can be produced with labor input L, while assuming that the input of intermediate goods is chosen in the most efficient way. If, however, the input of intermediate

goods is inappropriately chosen or inefficiently used, or if part of L does not function well, the output will be less than $F(L)$, and the amount of loss may be written by $\theta F(L)$, where θ is a non-negative random shock with mean μ_θ and variance σ_θ^2. Thus, the model assumes that the firm's value added is not necessarily $pF(L)$ but $(p - \theta)F(L)$, where p is the market price of the product.

This assumption is motivated by the fact that firms are prone to negative shocks such as errors and miscalculations (machine failures, spoiled materials, late supply of materials, use of wrong parts), or accidents like workers' injuries. These detrimental shocks occur randomly, but they may arise from inadequate production plans, the lack of work standards, or not having an established way for workers to do their jobs. If morale among workers is low, a large part of the output may be rejected by the buyers on the ground that the product quality is substandard.

Because the distribution of θ is truncated at zero, if its variance σ_θ^2 is reduced, its mean μ_θ is also reduced, and, accordingly, the firm's expected value added $(p - \mu_\theta)F(L)$ increases.[2] Although we admit that we are oversimplifying management, we define managerial capability as the firm's ability to reduce σ_θ^2 and to keep it low. In other words, higher managerial capability mitigates negative shocks and hence improves efficiency within the limit of the production function $F(L)$. By contrast, technological capability is defined as the firm's ability to shift $F(L)$ upward or increase p.

3.2.2 Managerial capability

In many models of the firm, it is assumed to be risk neutral and not to care about the variance of shocks. In our model, however, the variance of shocks does matter to the risk-neutral firm as well as to the risk-averse firm. The risk-neutral firm maximizes the expected profit

$$\max_L (p - \mu_\theta)F(L) - wL. \tag{1}$$

The first-order condition is given by

$$(p - \mu_\theta)F'(L) = w, \tag{2}$$

and the second-order condition is satisfied if the production function is concave, which we assume.

If the firm is risk averse, an appropriate assumption is that the firm maximizes the expected utility of the entrepreneur, and under certain assumptions, the expected utility maximization is equivalent to the maximization of the certainty equivalent of the entrepreneur's profit, which may be written as

$$\max_L (p - \mu_\theta)F(L) - wL - 0.5\gamma\sigma_\theta^2 F(L)^2, \tag{3}$$

where γ is the constant coefficient of absolute risk aversion. The first-order condition is given by

$$(p - \mu_\theta)F'(L) - \gamma\sigma_\theta^2 F(L)F'(L) = w. \quad (4)$$

A comparison of equations (2) and (4) indicates how risk aversion reduces employment, which is also illustrated by Figure 3.1. In this figure, the optimal employment size of the risk-neutral employer is L^*, with which the expected value of the marginal product of labor, that is, the height of the downward-sloping curve *ACD*, is equal to the wage rate as in equation (2). His expected profit is given by the area of the triangle between curve *ACD* and the horizontal line representing wage rate. The optimal employment size for a risk-averse employer is L^{**}, where curve *AE* representing the left-hand side of equation (4) cuts the horizontal wage line. The risk-averse entrepreneur fears detrimental shocks and chooses the smaller employment size L^{**}, and forgoes not a small amount of profit, which is represented by the area of triangle *CDE*. It should be clear that the difference between L^* and L^{**} as well as the lost profit *CDE* is smaller if either the variance of shocks or the risk-aversion rate is smaller.

The magnitude of variance σ_θ^2 in the above model is related to human resource management, quality control, and production management. It is easy to extend the model to cover inventory management and purchasing management. Suppose that there is an inventory of the finished product, and that the space for the inventory is limited. Both inventory overage and shortage are costly for the firm. If the inventory cost increases with the gap between the actual production value $(p - \theta)$

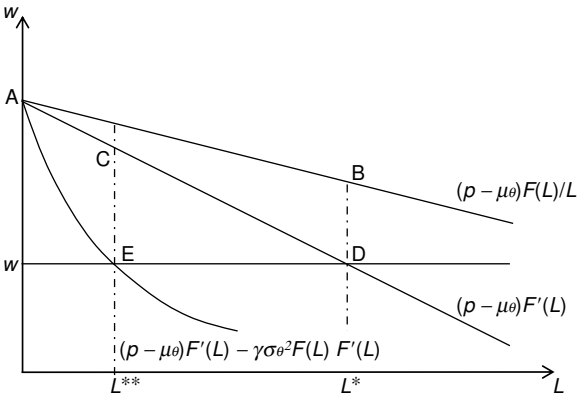

Figure 3.1 The determination of employment size
Source: Sonobe et al. (2014).

$F(L)$ and its mean $(p - \mu_\theta)F(L)$ and is approximated by a quadratic form, it will be proportional to $[(\theta - \mu_\theta)F(L)]^2$ and the expected profit may be written as $(p - \mu_\theta)F(L) - wL - \alpha F(L)^2\sigma_\theta^2$, where α is a positive constant.[3] Thus, the expected profit now looks almost the same as the certainty equivalent to the risky profit for the risk-averse firm, that is, equation (3), and the first-order condition is similar to equation (4) accordingly. With this type of inventory costs, therefore, even risk-neutral firms behave like risk-averse firms, for which we find it highly profitable to reduce the variance of shocks.

Intermediate inputs are another source of detrimental shocks to value added and profits because poor management may result in the purchase of unusable materials or the wasteful use of materials. If intermediate inputs are taken into account, the possibility that value added becomes negative (i.e., $p - \theta < 0$) emerges. To prevent these losses, it is important to improve the accounting system, grasp the state of businesses better, make concrete production plans, and purchase inputs in a prudent manner. Once intermediate inputs are introduced into the model, it is also natural to consider the shortage and overage of the work-in-process inventory, which are costly and of an important concern for firms. For example, one of the major features of Lean Manufacturing as well as the Toyota Production System is to reduce the work-in-process inventory to the limit. If the work-in-process inventory cost is introduced in the model, the objective function in the maximization of the expected profit will look similar to equation (3), and accordingly for the same reason as before, both employment and expected profits become smaller as the inventory cost increases.

We now discuss the impacts of the improvement of management practices by using Figure 3.1. Since the improvement of management practices, or a reduction in σ_θ^2, is accompanied by a decrease in μ_θ in equation (2), it will shift point A and curve ACD and AE upward, and hence increase L^* and L^{**}. Because σ_θ^2 in equation (4) decreases, curve AE will not just shift upward but will also rotate counter-clockwise, thereby coming closer to curve ACD. Thus, the improvement in management practices will make L^{**} closer to L^*, and, accordingly, the forgone profit CDE smaller.

3.2.3 Technological capability

In our definition, technological capability shifts the production function $F(L)$ and marginal product of labor $F'(L)$ upward, or it increases the value of product p, or both. The upward shift of $F(L)$ may be brought about by the adoption of a more sophisticated production process and

an increase in capital input, especially the installation of new machinery in which advanced technology is embodied. The improvement of product quality will increase p. Launching a new product may enable the firm to set a high price as a monopolist. The ability to set a high price may also be acquired by marketing activities. Thus, in our definition, marketing falls within the domain of technological capability rather than managerial capability.

An increase in technological capability will shift curves *ACD* and *AE* upward in Figure 3.1, thereby increasing L^* and L^{**}. If a technological change increases only $F(L)$ and $F'(L)$ but keeps p unchanged, L^{**} will not increase as much as L^* because the second term, $-\gamma\sigma_\theta^2 F(L)F'(L)$, on the left-hand side of equation (4) becomes greater in absolute value.[4] Moreover, the introduction of a new production process, which will not increase p, may increase the variance of detrimental shocks because of the unfamiliarity of workers and managers with the product or process as well as its intricacy. If this is the case, an increased technological capability will rotate curve *AE* only a little and can rotate it adversely (i.e., clockwise) as a result of the increased variance. Since the introduction of a new product will be associated with the introduction of new processes, it may have a similar adverse effect. Hence, technological upgrading may not necessarily offer handsome returns.

Technological upgrading will be more profitable if it is accompanied or preceded by a sufficient increase in managerial capability to offset the increase in the variance. Furthermore, without an increase in managerial capability, the increase in technological capability will increase the probability with which the firm runs a deficit or even goes bankrupt.

Note that we are not arguing that increases in managerial capability are more important or more profitable than increases in technological capability. To improve productivity in a sustained manner, the improvement of management practices alone will be insufficient. Probably, the scope for the firm to reduce the variance of shocks continually will be increasingly limited. Thus, an increase in managerial capability should precede or be accompanied by an increase in technological capability. What we would like to emphasize is that an increase in managerial capability will increase the expected returns on investment in technology and reduce the risk associated with the introduction of new products, processes, and marketing channels. Once new products and new production processes are introduced and new marketing methods are adopted, the variance of negative shocks is likely to increase, making it profitable again for the firm to increase managerial capabilities. In this way, both managerial and technological capabilities can be improved continually.

3.3 Selected case studies

This section illustrates some predictions made by the above model using four selected examples of cluster-based industrial development, three of which were introduced in Chapter 2. As mentioned earlier, there are good reasons why firms are attracted to clusters. First, clusters reduce transaction costs and coordination costs between manufacturing enterprises and between manufacturers and traders (Becker and Murphy, 1992; Sonobe and Otsuka, 2006). Since many entrepreneurs and traders in a cluster are acquainted with each other and exchange information about the personality and conduct of others, dishonest behavior is likely to be detected and heavily punished, and thus the temptation to behave dishonestly tends to be suppressed. Low transaction costs facilitate the division of labor between manufacturers and traders. Second, the division of labor enables manufacturers to specialize in a narrow range of the production process, which saves both working capital and fixed capital (Ruan and Zhang, 2009). Third, clusters facilitate matching between job seekers with special skills and employers in need of those skills and between sellers and buyers. Fourth, industrial clusters facilitate knowledge spillovers, so that new ideas of business spread quickly within a cluster.[5]

Table 3.1 presents the four selected clusters and the data on their locations, main products, populations of final goods producing firms, mean and median employment sizes, and labor productivity levels (defined as value added divided by the number of workers), comparing the first year and the last year in which we gathered information. The last column of the table presents the coefficient of autocorrelation of labor productivity between the last year and one year earlier, except for the second cluster, where data were available only at intervals of five years. The intention of showing the autocorrelation coefficients will be explained below.

3.3.1 The garment industry in Bangladesh

The first cluster we discuss is the export-oriented garment industry in and near Dhaka, the capital city of Bangladesh, which has grown steadily over the last three decades (Mottaleb and Sonobe, 2011). In our view, nothing is more instructive than the development experience of this garment cluster in understanding the roles of the acquisition of managerial and technological capabilities. Figures 3.2a and 3.2b present scatterplots of the data on the number of workers and value added per worker in this cluster in 2000 and 2005.[6] The summary statistics of these

Table 3.1 Characteristics of selected industrial clusters

	(1) City (Country)	(2) Product	(3) Year	(4) No. of firms in the cluster[a]	(5) Number of workers per firm		(6) Labor productivity (value added per worker)		(7) Correlation coefficient[b]
					Mean	Median	Mean	Median	
1	Dhaka (Bangladesh)	Garment	2000	3,200[d]	697.5	350	449	298	R(1 year)=0.94
			2005	4,100[d]	1,231.7	724	405	312	
2	Wenzhou, Zhejiang (China)	Electrical fittings	1990	60	46.7	26	291	214	R(5 years)=0.54
			2000	120	338.6	110	603	431	
3	Hatay (Vietnam)	Knitwear	2009	170	19.5	9	600	383	R(1 year)=0.38
			2010	160	20.1	10	573	470	
4	Kumasi (Ghana)	Metalwork	2004	1,000[d]	5.6	5	564	294	R(1 year)=0.67
			2008	1,000[d]	5.2	5	247	143	

[a]Only the final goods producing firms are counted unless otherwise indicated.

[b]This column shows the autocorrelation of labor productivity between 2004 and 2005 in Cluster 1, 1995 and 2000 in Cluster 2, 2009 and 2010 in Cluster 3, 2007 and 2008 in Cluster 4. $R(x$ years) stands for autocorrelation coefficient between year t and year $t + x$.

[c]This is the number of export-oriented garment manufacturers, including firms outside Dhaka, but excluding firms producing traditional costumes only.

[d]In the same cluster, a large number of car-repair garages and electricians are operating. The total number of firms in the cluster is estimated to be more than 10,000.

Sources: Mottaleb and Sonobe (2011) for Bangladesh; Sonobe and Otsuka (2006) for China; Suzuki et al. (2014) for Vietnam; and Mano et al. (2012) for Ghana.

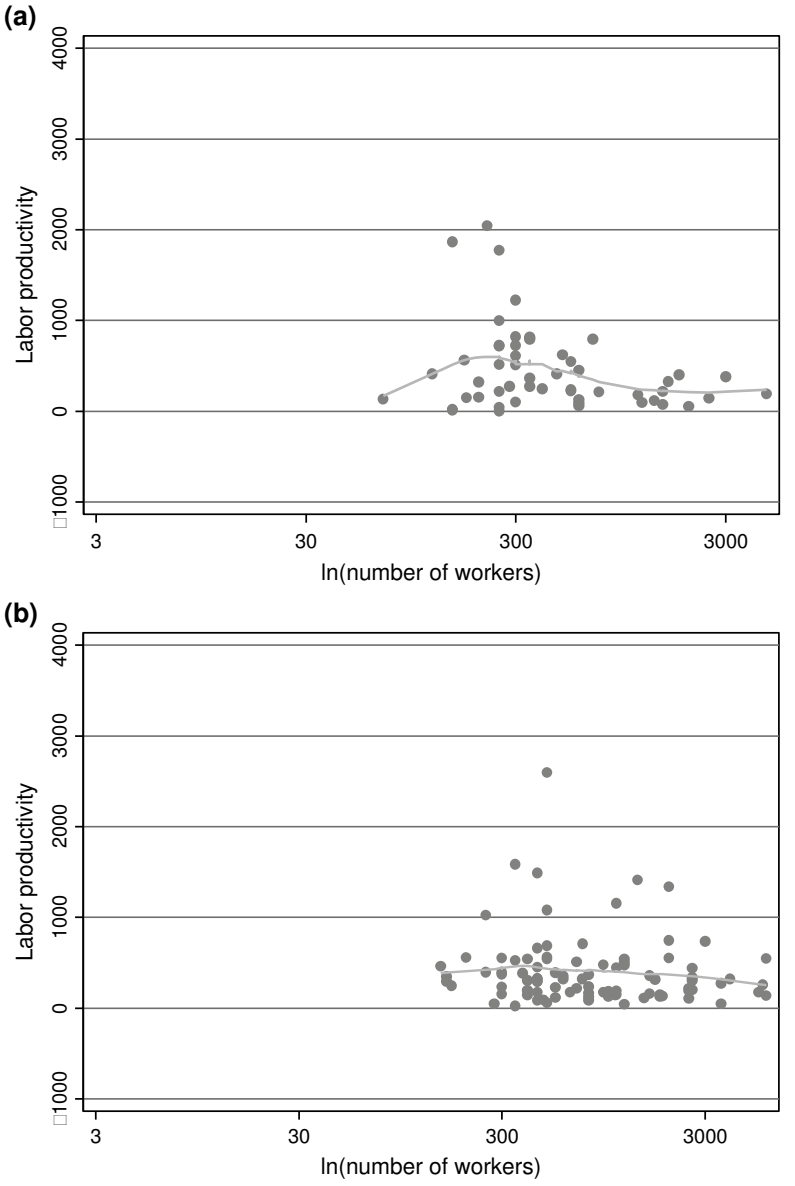

Figure 3.2 Labor productivity and employment size: Dhaka (Bangladesh) cluster in (a) 2000 and (b) 2005

variables are reported in columns (5) and (6) of Table 3.1. The vertical axis of the scatterplots measures the monthly value added per worker in US dollars as labor productivity.[7] The horizontal axis measures the logarithm of the number of workers.[8]

During the period 2000–2005, this industry was growing as rapidly as in other periods in the last three decades. According to Mottaleb and Sonobe (2011), there were increases in technological capability in this industry during this period, such as the increased use of sophisticated machinery and the gradual upgrading or shift toward high value-added or fashionable products. The employment sizes of the largest firms were greater in 2005 than in 2000. The prices of products, however, were kept low by increasingly intense competition in the global market. This is probably the reason why value added per worker for the largest firms did not increase significantly and it declined slightly for the firms with about 300 workers, as the locally weighted scatterplot smoothing curves in the two figures indicate.

Nonetheless, the scatterplots in the two figures differ in two respects. First, value added per worker is more widely distributed (in the vertical direction) in 2005 than in 2000. Second, employment size is also more widely distributed (in the horizontal direction) in 2005 than in 2000.[9] In both scatterplots, the variance of value added per worker (the variance in the vertical direction) is somewhat smaller for the largest firms than that of the other firms. These three observations are consistent with the model developed in the previous section. Recall that the firms in the cluster share many characteristics, and assume that the employment size of the firm is largely determined by its managerial capabilities (or σ_θ^2), just like L^{**} in Figure 3.1. Under this assumption, larger firms are large because they have smaller σ_θ^2 and accordingly smaller μ_θ. Because of the smaller μ_θ, their $(p - \mu_\theta)$ is greater, but because of their greater employment, $F(L)/L$ is smaller. Hence, the mean value added per worker $(p - \mu_\theta)F(L)/L$ of larger firms is not much different from that of smaller firms. During the period from 2000 to 2005, firms increased in technological capability, which might well increase their σ_θ^2. This offers an explanation why data points are more widely distributed in both the vertical direction and horizontal direction in panel (b) than in panel (a). Because smaller firms have greater σ_θ^2 under our assumption, their value added per worker is distributed more widely than that of larger firms.

3.3.2 Electrical-fittings industry in China

The second case we review is the development of the electric-fittings industry in Yueqing township, Wenzhou, China (see Chapter 2 for

further details). The rapid growth of this industrial cluster began in the early 1990s. Real sales revenue and real value added per firm increased threefold from 1990 to 1995 and then tenfold from 1995 to 2000 (see Table 2.2). According to Sonobe et al. (2004), this cluster improved product quality drastically, adopted a marketing method suitable for the improved products, and improved management practices drastically, so as to profit from the rapidly growing demand for electric fittings due to the construction boom in the country, without being bogged down in cut-throat price competition with producers in other parts of the country.

We have the data that cover the period of its multifaceted innovation, and, thus, Figures 3.3a and 3.3b capture the impact of the multifaceted innovation on productivity and employment vividly. The innovation started with the adoption of simple quality inspection, followed by branding, the spread of the network of exclusive sales agents across the country, the expansion of firm size through purchasing factories, and the employment of managers as well as engineers who had high education and work experience in state-owned enterprises. By 1990, only one firm had achieved all these changes. This innovator is shown in Figure 3.3a as the largest firm. Several other firms soon began imitating the multifaceted innovation and a few continued with it thoroughly to become larger than the innovator by 2000.

The firms that have achieved the multifaceted innovation produce higher quality and higher value-added products with higher efficiency by using machinery more intensively and hiring more highly educated engineers and managers. At the same time, their established brand names make mass production and mass selling profitable and hence they have greater employment sizes than before. Because of their size expansion, the distribution of data points expanded rightward and upward considerably so that it shows a positive association between labor productivity and employment size among the innovative firms. This result lends support to the hypothesis that innovation leads to the emergence of large firms with high productivity. In this dynamic cluster, the variance of labor productivity became larger in 2000 than in 1990, presumably because of the greater complexity of management under the dynamically changing production technology and products.

3.3.3 Survival cluster

As the third example, we take a cluster near Hanoi, the capital city of Vietnam, producing sweaters and other knitwear items for an export market in Eastern Europe and for a small domestic market (Nam et al., 2009).[10]

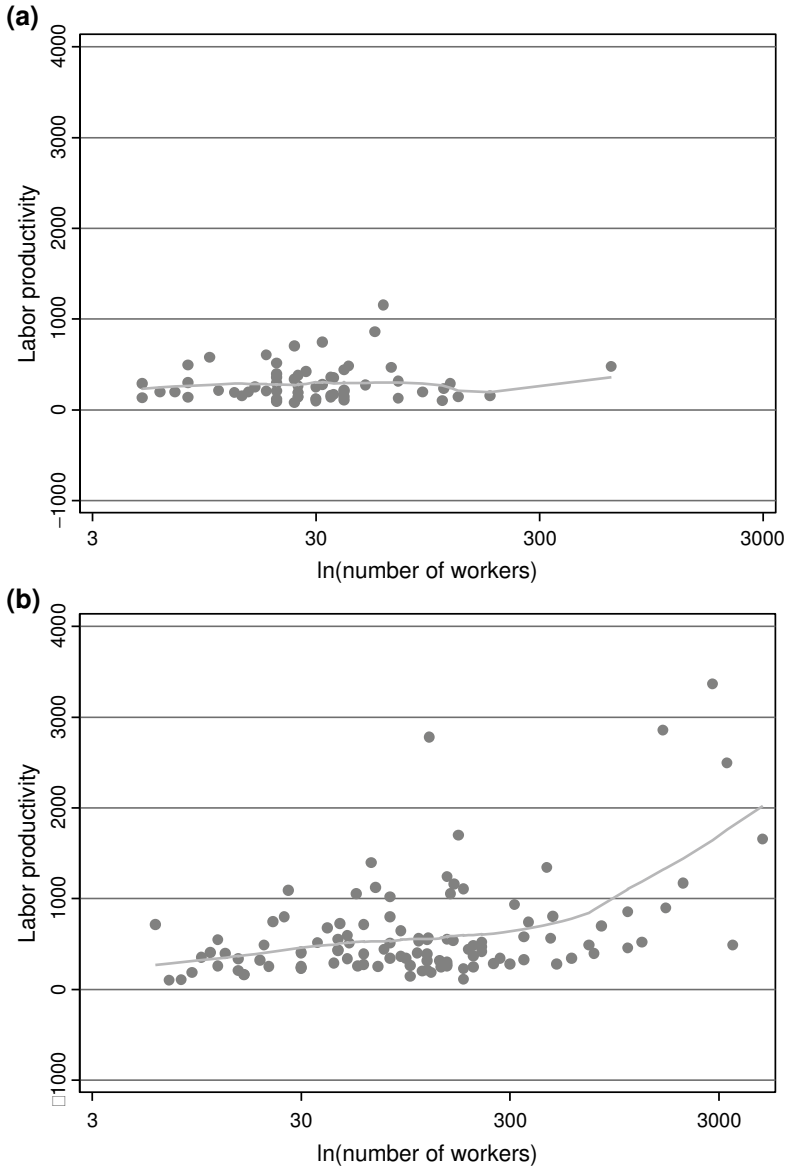

Figure 3.3 Labor productivity and employment size: Wenzhou (Zhejian Province, China) electrical-fittings cluster in (a) 1990 and (b) 2000

This small cluster coincides with a village geographically. Our sample covers nearly the whole population of knitwear firms in this cluster. The quality of the cluster's products was improved when exporting began. Several firms have adopted the factory production system employing more than 100 workers. This part of this cluster is dynamic. All other firms, however, rely heavily on a large number of household subcontractors in neighboring villages for a substantial part of the production process.

The productivity of these small firms varies randomly due to poor management. The random fluctuation of productivity at each small firm is reflected in a wide variation of productivity in a cross section of these firms, as shown in Figure 3.4a. It is also reflected by the low autocorrelation of labor productivity between two consecutive years 2009 and 2010 in this cluster, which is shown in column (7) of Table 3.1. This autocorrelation is much lower than that between 2000 and 2005 in the Dhaka garment cluster and the autocorrelation between 1990 and 2000 in the Wenzhou electrical-fitting cluster. Figure 3.4a, moreover, indicates that many firms had negative value added per worker in 2009 and that some small firms had very high value added per worker in this year. It is hard to believe that the same firms can have negative value added every year or that small firms can have high value added per worker every year without growing into larger firms. In other words, the productivity of these firms fluctuates wildly from year to year.

Consistent with the prediction of our theoretical model, the variance of labor productivity is smaller for the firms with relatively larger employment, and labor productivity does not increase with employment size. Comparing Figures 3.4a and 3.4b, it is not difficult to establish that the variance in labor productivity in 2010 is much smaller than that in 2009. The reduction in the variance can be partly the result of a management training program that we provided in cooperation with the World Bank just before the busy season in 2010 as an experiment (see Chapter 7). In this experiment, there were two types of treatment: classroom training and on-site consultation. Nearly three-quarters of our sample enterprises received either one type or both types of treatment. As we will explain shortly, there is evidence that the training had impacts on the management practices of the training participants. Moreover, there is no doubt that knowledge spilt over from the participants to non-participants because almost everyone in the village was a sibling, relative, school friend, or neighbor of the participants.[11] Thus, it is likely that the good effects of the management training on the participants and, to a lesser degree, on the non-participants reduced the

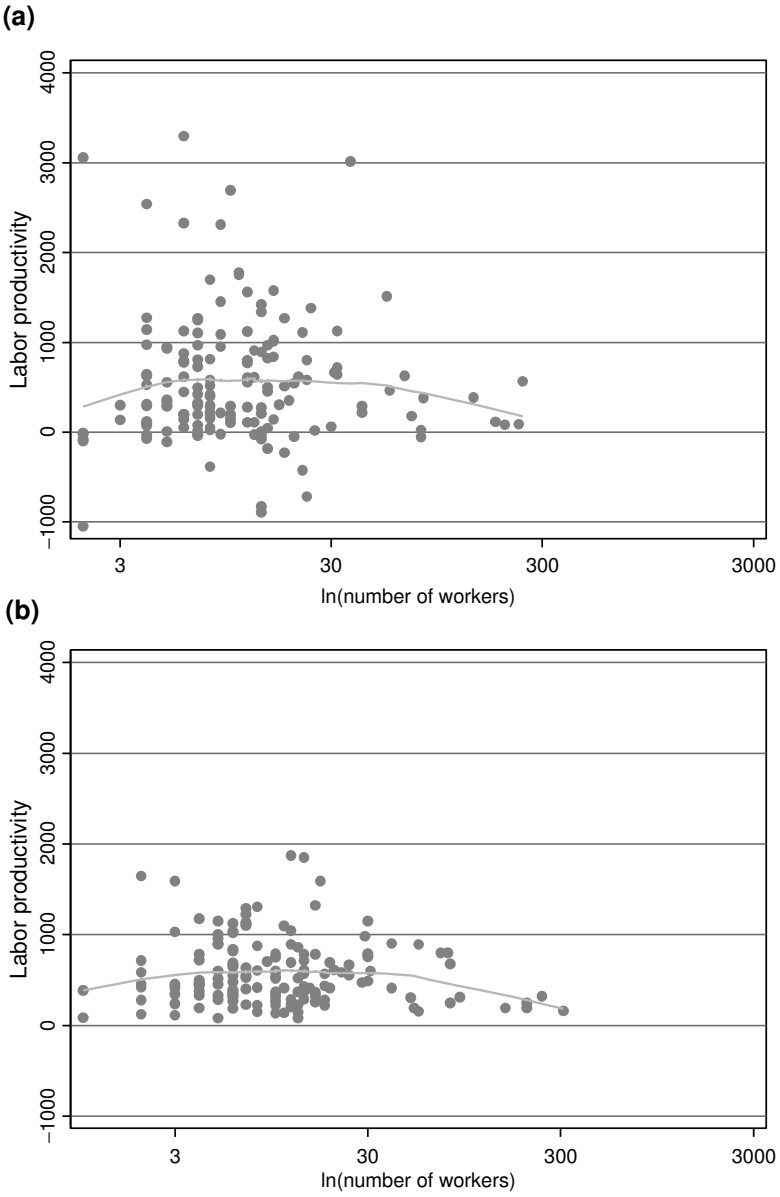

Figure 3.4 Labor productivity and employment size: Hatay (Vietnam) garment cluster in (a) 2009 and (b) 2010

variance in their labor productivity, even though the mean employment size and the mean productivity, as shown in Table 3.1, did not yet increase significantly in 2010.

The last example is another typical survival cluster of MSEs, to use the terminology of Altenburg and Meyer-Stamer (1999), even though it is huge in terms of the number of firms. The cluster has a long history and is located in Ghana's second largest city, Kumasi—where the two arterial roads from the coast become one leading to the inland arid region—has an extraordinarily large number of car repairers fixing large trucks as well as passenger cars. We analyze this case in greater detail in Chapter 4. The target of our case study there is a minority group consisting of about 1,000 metalworking firms. They find some advantages of being near each other, including the abundant availability of used metal and the high demand for repair parts and other metal products that they produce. Our sample accounts for about 15 percent of this population of metalworking firms, and about one-third of our sample were invited to a management training program toward the end of 2007 (Mano et al., 2012). This training program was also provided by the World Bank as an experiment.

The dominant mode of employment in this cluster is self-employment. For the last decade, almost all owners have paid at least a small amount of money to their apprentices. Thus, we count the apprentices as workers. Since many apprentices become masters after several years of training, firms producing the same products proliferate, which lowers the product prices and, hence, the profitability. This is why the metalworking firms in this cluster are small in size and unprofitable. Figures 3.5a and 3.5b show that this cluster has a smaller employment size than the other three clusters discussed in this chapter. The variance in the measured labor productivity is smaller in this metalworking cluster than in the knitwear cluster in Vietnam, probably because the absence of fashion change makes the demand for metalwork products more stable than that for knitwear products. Still, the variance is larger than in the Dhaka garment cluster and the Wenzhou electrical-fitting cluster.

A simple but important finding from the above-mentioned management training program in the metalworking cluster is that only one out of four masters kept records of transactions and none separated household or personal finances from firm finances (Mano et al., 2012). Figures 3.5a and 3.5b indicate that firms with relatively large employment size have smaller variance in labor productivity, consistent with our main hypothesis.

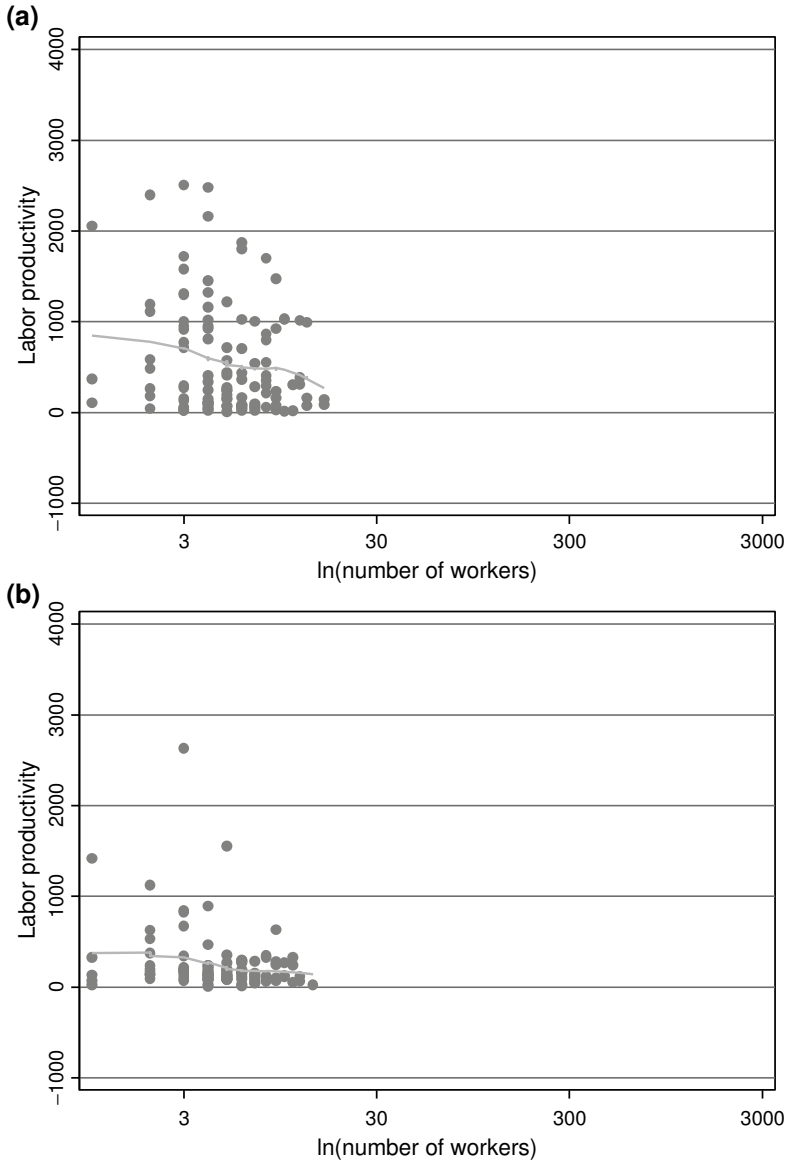

Figure 3.5 Labor productivity and employment size: Kumasi (Ghana) metalworking cluster in (a) 2004 and (b) 2008

3.4 Management training and dissemination

3.4.1 Results of management training experiments

In recent years, an increasing number of randomized controlled experiments have been carried out to test the effectiveness of management training and consulting services provided to MSEs in various parts of the developing world (e.g., Berge et al., 2011; Drexler et al., 2014; Field et al., 2010; Karlan and Valdivia, 2011; Mano et al., 2011). These studies commonly find that the owners and managers of MSEs had very limited management knowledge before receiving the management training or consulting service. While the management practices taught in these experimental training programs were rather basic, few of the training participants knew them, and even fewer had adopted them before they received the training.

Presumably this is because the value of learning about management practices is little known to MSE entrepreneurs. Indeed, the average take-up rate for the offer of experimental training programs surveyed by McKenzie and Woodruff (2012) was only 65 percent, despite the fact that most of these programs are provided for free and many are provided for micro-credit clients by micro-credit organizations. The good news, however, is that many participants adopted the management practices that they were taught during the training programs. Moreover, Suzuki et al. (2014) report that the entrepreneurs' willingness to pay for management training, which was initially low, increased greatly after experiencing the training.

There are three possible explanations for the ignorance. First, MSE owners and managers may undervalue learning about management while overestimating their own management skills.[12] They may also have a tendency to put off paying for expensive activities such as learning and investing.[13] Second, a market failure occurs because owners and managers do not know who possesses the knowledge they want to acquire, and when they do know, they are not able to verify whether or not the person has passed that knowledge to them. Once sellers share their knowledge, the buyers may quickly grasp and become unwilling to pay for it. Because of this asymmetric information problem, the transaction of knowledge is difficult unless the seller has established a good reputation. Third, even if the transaction of knowledge is possible, another market failure may arise from the difficulty in keeping the purchased knowledge secret. If imitation is expected to be widespread, businesses will be reluctant to pay, preferring to get a free ride.

Information spillover or imitation is rampant in industrial clusters. Visual inspection and reverse engineering of the new products of rival

enterprises, poaching knowledgeable workers from rivals, and the acquisition of confidential technological information from a rival's parts-suppliers are common methods of imitation. Patent protection of technological information is effective only for a limited set of knowledge. Although managerial knowledge is as important as technological knowledge, it cannot be patented. Due to information spillovers, the social return to creating and introducing new knowledge—which encompasses the development of new superior products, production methods, marketing channels, and internal management systems—exceeds the private return. If left to free-market forces, the gap between the social and private returns in turn results in a socially sub-optimal level of investment in new innovative knowledge. Thus, governmental support for innovation may be warranted, as in the case of the Industrial Technology Research Institute in Taiwan, which facilitated the import of foreign technologies by means of adaptive research and training (Hou and Gee, 1993). Note that "innovation" here refers to "imitative innovation" or "improvement" which is new to the cluster, not to the world.

In order for an enterprise to grow, its manager must be an entrepreneur who constantly strives for new innovations. To become dynamic entrepreneurs, managers must invest in their managerial human capital, but insufficient financial resources may preclude this. In reality, the majority of small entrepreneurs in SSA are far from being such dynamic entrepreneurs. For example, they operate their businesses without realizing whether they are making profits or losses because they seldom or never keep records of transactions and inventories. This clearly indicates that their investment in managerial capital has been far below the optimal level. It seems to us that the gross under-investment in managerial capital is a major constraint on efficient enterprise management and enterprise growth in low-income countries.

Although a number of experiments have confirmed that management training can improve management practices significantly, it is not yet established that management training improves business performance in terms of the accounting-based performance indicators, such as sales, value added, profits, and labor productivity, of the treated firms (McKenzie and Woodruff, 2012). These results may not come as a surprise because the training programs that were provided in these experiments lasted for a short period involving only a small number of instructors. A notable exception is the large-scale training experiment on large Indian textile firms conducted by Bloom et al. (2013), which finds strong impacts of a large-scale treatment (781 consultant hours per treated plant) on productivity.

3.4.2 An assessment of management training experiments

We conducted four small-scale randomized experiments on management training, and the results were similar to the results of the other small-scale experiments mentioned above. Our experiments were conducted in the knitwear clusters in Vietnam and the metalworking cluster in Ghana, which were discussed in the previous section, as well as in two other survival clusters in Vietnam and Tanzania (see Table 3.2). The outline and main results of our experiments may be summarized as follows.

Table 3.2 Management training programs' costs and effect on value added

	Cost per participant (USD)	Estimated effect on annual value added (USD)[a]	Estimator[b]
Classroom-training			
Knitwear cluster in Vietnam	1,555	4,560 (16,829)	DID-ITT
Metalworking cluster in Ghana	740	13,890* (8,339)	ANCOVA
Rolled steel cluster in Vietnam	2,050	27,302 (35,211)	DID-ITT
Garment cluster in Tanzania	4,179	4,181* (2,218)	DID-ITT
On-site training			
Garment cluster in Tanzania	2,043	4,038** (1,987)	DID-ITT
Both classroom and on-site			
Garment cluster in Tanzania	6,222	3,882* (2,309)	DID-ITT

Notes: Standard errors are in the parentheses. * and ** indicate significance at the 10 percent and 5 percent levels, respectively. Classroom training was conducted in July–August 2010 in the knitwear cluster in Vietnam, in November–December 2007 in the metalworking cluster in Ghana, in July–August 2010 in the rolled-steel cluster in Vietnam, and in May–June 2010 in the garment cluster in Tanzania. On-site training in Tanzania was conducted in December 2010.

[a]Annual data were used to estimate the training effect in the three clusters other than the garment cluster in Tanzania, where we used quarterly data.

[b]DID-ITT stands for difference-in-differences estimator of the intention-to-treat effect of the training program. ANCOVA stands for Analysis of Covariance, which controls for observed covariates as well as past outcomes in the estimation of treatment effect using training invitation as an instrumental variable.

Sources: Mottaleb and Sonobe (2011) for Bangladesh; Sonobe and Otsuka (2006) for China; Suzuki et al. (2014) for Vietnam; and Mano et al. (2012) for Ghana.

In each of the four clusters, management training was provided to entrepreneurs in a classroom setting by local business consultants in local languages and by international consultants accompanied by an interpreter. The program consisted of three modules: marketing and entrepreneurship, production management including an introduction to a few basic concepts of *Kaizen*, and record keeping. Before the program, we conducted a baseline survey of firms in each cluster and assigned sample firms randomly to the treatment and control groups. It was up to the entrepreneurs in the treatment group to decide whether to attend the training program, which lasted three weeks.[14]

In the clusters in Vietnam and Tanzania, we also offered on-site training several months after the classroom training was completed.[15] The assignment to on-site treatment was random and independent of the random assignment to the classroom training. Thus, some entrepreneurs received both types of training. The follow-up surveys were conducted a few months later and also more than a year later.

From these experiments, we have learned that entrepreneurs of MSEs were little aware of basic management practices, that they soon understand the usefulness of such practices and become willing to learn how to apply them, and that roughly half of the participants put the new knowledge into practice. Indeed, in all these clusters, the estimated impacts of the training effects on the adoption of various management practices that were taught in the program are positive and statistically significant. Another impact of the training program is found on the longevity of the firm. In Cluster 4, while not a few firms in the control group stopped operation or completely closed down, there was no incidence of exit among the participants. The difference was statistically significant.[16]

As shown in Table 3.2, the estimated effects of training on the participants' value added are insignificant or marginally insignificant, except for the on-site training in Tanzania. Note, however, that the follow-up data in Vietnam and Tanzania were taken only six months after the classroom training and three months after the on-site training was completed.[17] It is no wonder that the estimated effect is statistically weak. Moreover, these estimates neglect to take into account the favorable effect of the training on non-participants through knowledge spillovers. Thus, the estimated effect on value added is likely to be only a small part of the social benefit of the training program.

In our observation, participants expressed deep appreciation to the management training programs almost without exception. Suzuki et al. (2014) find that the demand for management training programs was low

prior to the training but increased greatly with their own experience, which can be seen in changes in the willingness to pay the training fees before and after the training. Interestingly, after hearing of the value of the training program from participants, non-participants also expressed greater willingness to pay the training fees. These findings suggest that it is a lack of knowledge about the benefits of training that hinders the development of a market for management consulting services in developing countries.

Although the estimated effects on value added are, as shown in Table 3.2, insignificant or only marginally significant, it is remarkable that they tend to exceed the training costs. Since the benefit of the training program will continue to accrue in the coming years, the present value of the total benefit will be much greater than the increase in annual or quarter-year value added due to the training program. Moreover, the training cost shown in Table 3.2 includes the costs that could be saved, such as the cost of preparing teaching materials, if a training program is repeatedly provided.[18] Thus, it is quite possible for future rounds of follow-up surveys to establish that the social benefit from the provision of the management training program exceeds the cost of the provision.

3.5 Conclusions

It is widely accepted that good management is critically important for firms, especially large firms consisting of many groups with different functions (Drucker, 1973). The present chapter has found that management is important for MSEs as well. Among various aspects of management, particularly important for MSEs is to keep control of the production pace because wild fluctuations in production make the expansion of employment size highly risky and cause overproduction and other wasteful uses of resources. For MSEs, it should be useful to teach the importance of record keeping and pricing based on the analysis of records and basic knowledge of marketing and workshop housekeeping. In fact, the recent results of randomized experiments, including our experiments in Vietnam, Ghana, and Tanzania, indicate that basic management training helps training participants' firms improve management practices, reduces the variance of productivity and the incidence of exit, and is likely to benefit participants enough to justify the cost of providing the training.

Our analysis, however, indicates that the provision of basic management training is not enough to help firms grow dynamically so that they can create ample job opportunities. Dynamic firm growth is a result of

multifaceted innovations led by entrepreneurship. Thus, it is important to nurture entrepreneurs' innovative capacity. Compared with managerial capacity, innovative capacity in general is probably more elusive and accordingly more difficult to teach to entrepreneurs. Nonetheless, our review of dynamic cluster development suggests that there is a common pattern: dynamic clusters in different sectors in different countries have shared similar experiences of a series of innovations starting with product quality improvement followed by branding, improvements in marketing, strengthening relationships with suppliers, and improvements in the management of labor, inventory, and finances. This finding brings new hope: entrepreneurship relevant to industrial development in low-income countries may be taught. A considerable compilation of empirical studies is clearly warranted to learn more about the operational practicalities of teaching management and entrepreneurship and the diffusion process of managerial and entrepreneurial knowledge. In particular, we believe that *Kaizen* management ought to play a critical role in achieving innovations leading to the dynamic path of cluster-based development.

Part II

Impacts of Management Training

4

The Large but Varying Effects of Basic Management Training in a Metalworking Cluster in Kumasi, Ghana[1]

4.1 Introduction

Micro and small enterprises are widely recognized as a major source of employment and income in developing countries. If they grow in size, they would contribute more to economic growth and poverty reduction. In reality, however, their productivity remains low and their sizes remain small (e.g., Mead and Lieadholm, 1998; Tybout, 2000). While their low performances may be attributed to the unfavorable circumstances surrounding them, recent empirical studies have identified problems within firms, especially problems regarding management (e.g., Bloom et al., 2010; Bruhn et al., 2010; Sonobe et al., 2011).

This chapter attempts to shed light on the impacts of trial management training by using experimental data gathered before and after a management training program offered to MSEs in Kumasi, Ghana. In our view, MSE entrepreneurs' lack of management knowledge has a great deal to do with their locational choices. Although the existing studies do not specify where their subjects are located, we suspect that they are located in industrial clusters because the vast majority of MSEs in developing countries are located in such clusters, defined as the geographic concentration of a number of firms producing similar and related products. Industrial clusters are spontaneously formed in a wide range of countries and sectors because of the benefits of localization economies (see Chapter 2). As documented in recent case studies, localization economies in clusters allow new entrants with little managerial and financial capital to start businesses (e.g., Ruan and Zhang, 2009; Schmitz and Nadvi, 1999; Sonobe and Otsuka, 2006, 2011). Moreover, like human capital, managerial capital may well be under-invested in,

and many entrepreneurs may be unaware of the value of acquiring managerial capital (Bloom et al., 2010). Thus, it is not surprising that MSE entrepreneurs lack basic knowledge and skills regarding management. As a case study by Iddrisu et al. (2012) indicates, however, it is likely that many such entrepreneurs are now willing to learn about management because the profitability of their businesses have been declining due to intensified competition with an increasing number of new entrants producing similar products and the massive import of cheap products from newly industrialized economies.

This study provides an elementary management training program for MSE entrepreneurs in an industrial cluster. It examines whether the entrepreneurs are willing to learn about management and to what extent the training improves the performance of their businesses. We find that the vast majority of the entrepreneurs invited to the training program attended the sessions in earnest, and that many adopted the management practices taught in the program. None of the participants' firms were closed down, whereas nearly 10 percent of the enterprises in the control group were closed down after the training. The difference in survival rate between the treatment and control groups is statistically significant. As with the existing studies, however, we find that the estimated average effects of the training on accounting-based measures of performance, such as sales and profits, are economically large but statistically insignificant. In the experiment carried out by Bruhn et al. (2010), the provision of consulting services to MSEs was expected to improve the clients' business performances, but statistically, the effects were only marginally significant. The authors attribute this result to "noisy" data and the relatively small sample size. In the case of our experiment, the training increased the percentage of participants adopting the recommended practices from near 0 to 50 percent; however, the rest of the participants did not even attempt to adopt the practices. Such variation among the participants seems to be a cause of the statistically weak effect of the training on the participants' business performance.

Section 4.2 reviews the studies of industrial clusters in developing countries and clarifies the questions to be addressed in this chapter. Section 4.3 describes the sampling scheme and the training design, and Section 4.4 presents the basic statistics. After specifying the regression models, Section 4.5 reports the estimation results and discusses the directions of possible estimation biases due to attrition, spillovers, market stealing, and psychological effects. Finally, Section 4.6 discusses the implications for future research.

4.2 Location and management of MSEs

At its early stage of development, a cluster attracts a swarm of new entrants, and the increased scale of the cluster reinforces the localization economies. This phase of industrial development is referred to as the quantity-expansion phase since the expansion of the cluster is based on the new entry of imitators without any qualitative improvement in the products or the production processes (Chapter 2). It seems that in this phase, owners do not keep records of transactions or inventory (e.g., de Mel et al., 2009), and they fail to separate financing for their businesses from that of their own households. Even casual observers notice that in such disorganized workshops, owners and workers waste time looking for necessary tools and materials on a daily basis. Although these owners are not managers in the real sense of the term, they are still able to maintain their small businesses. Because every transaction and activity takes place in full view of the owners, small businesses are easy to operate.

According to Chapter 2, successful quality improvement involves the establishment of brand names, the development of new marketing channels, and the introduction of a standard management system with stricter control of product quality and work effort, and the establishment of trust-based long-term subcontracting relationships with parts-suppliers. For such multifaceted improvements, it is important to gain knowledge about technology and management from outside the cluster and to take advantage of the pool of human resources within the cluster, such as traders, engineers, and parts-suppliers. With the progression of quality improvement, successful firms become larger and the total number of firms decreases through exits and mergers of inefficient firms.

Thus, a cluster may either enter the quality improvement phase or stay as a survival cluster. A major hypothesis in this chapter is that among the important determinants of a cluster's fate is the management knowledge of the entrepreneurs in the cluster. We examine to what extent basic management training can improve the business practices and performance of firms in a survival cluster.

According to the literature on technology diffusion, the same technology is adopted by different adopters several years apart, and a major explanation for such a phenomenon is that different adopters put different values on the new technology (e.g., Hall and Khan, 2003). Likewise, management training participants will be heterogeneous in both incentive and in the ability to put the knowledge they gain from the training into practice. Moreover, their business performance will be subject to idiosyncratic shocks. Thus, we expect that the effect of the training on performance will vary considerably among the participants.

If management training proves to be useful for at least some participants, the question arises as to whether the benefit is large enough to justify the cost of the training. For this reason, we focus on the short-run private benefit because the benefits and losses for non-participants, neighbors, and consumers (i.e., social welfare) are practically impossible to capture in the data. In short, this chapter examines the effects of a managerial training program on the participating entrepreneurs' business practices and performance, and compares the cost and private benefit of such a program.

4.3 Surveys and training program

Our study site is Suame Magazine,[2] located in Kumasi, the second largest city in Ghana. Kumasi is a junction of arterial roads connecting major coastal cities and major inland cities including Ouagadougou, the capital city of Burkina Faso. Suame Magazine is known in West Africa as a large cluster of garage mechanics, but it is also a cluster of metalwork enterprises producing a variety of metal products, such as bolts and nuts, corn mill machines, threshing machines, and cash safes.[3] The garage cluster has had a long period of quantitative expansion because the demand for car-repair services has increased dramatically. As the garage cluster expanded, scrap metal became increasingly available, helping the expansion of the metalwork cluster.

We conducted a survey of metalwork entrepreneurs in early 2005. At that time, most owners, whether garage mechanics or metalwork entrepreneurs, were members of the Suame branch of the Ghana National Association of Garages (GNAG). As shown in Table 4.1, the number of members in 2003 exceeded 10,000, of which more than 1,000 were metalwork entrepreneurs. The number of metalwork entrepreneurs does not seem to have increased since then. As will be shown in Table 4.3 below, the profitability in this cluster began decreasing clearly in the early 2000s. The metalwork cluster in Suame Magazine is a typical survival cluster except for the extraordinarily large size of the annexed garage cluster. For the survey, we selected 167 metalwork entrepreneurs randomly from the GNAG member list. Their data on educational and occupational backgrounds, production and costs, marketing channels, and investments were gathered by visiting each of them (Iddrisu, 2007).

The training program was implemented for three weeks from the middle of November 2007.[4] The program consisted of three modules of classroom training: Module 1 on entrepreneurship, business planning,

Table 4.1 Estimates of enterprise population in the Suame Magazine Cluster in Kumasi by sector

	Garages	Metalworking enterprises	Others	Total
2000	4,958	807	2,204	7,969
2002	6,222	990	2,618	9,830
2003	7,847	1,139	2,844	11,830

Notes: Estimates do not include ancillary trades such as restaurants and telecommunication shops. "Others" include truck-body builders, pot makers, sign makers, and some types of welders.

Source: These estimates are taken from the database of the Suame branch of the Ghana National Association of Garages (GNAG).

and marketing; Module 2 on production management and quality management; and Module 3 on record keeping and costing.[5] Each module lasted for 5 weekdays, 2.5 hours per day in the evening. The venue was the Suame Branch of the National Vocational Training Institute (NVTI) in the cluster, so that busy entrepreneurs could attend the classes after work.

The instructors were three Ghanaian consultants with extensive experience. They were selected through an international competitive tender, based on both the cost and quality of their submitted proposal, following the World Bank's procurement guidelines.[6] They spoke the local language, Twi, and thus communicated smoothly with the participants. Modules 1 and 3 were based on the textbooks of the improve-your-business (IYB) and start-your-business (SYB) training program developed by the International Labour Organization (ILO). IYB and SYB are implemented as standard business training modules in many developing countries. Our instructors emphasized the importance of identifying good customers, separating business and household finances, keeping records, and other very basic practices. Drexler et al. (2014) find that a "simplified, rule-of-thumb" training of accounting has significant impacts on business results. The third module of our program involved exactly such basic training on record keeping. The training hours were allocated almost evenly to the instructors' lectures and to group work and debates.

The contents of Module 2 were not as standard as those of Modules 1 and 3, but they were as easy to understand. This module began with an explanation of the concepts of productivity and quality, which was followed by discussions regarding the *Kaizen* management. Before selecting

the entrepreneurs to invite to the training program, we were advised by an adult education expert that the number of participants in a classroom should be 60 or less. Since we had already committed ourselves to inviting seven entrepreneurs who had assisted in our study, we selected 53 other entrepreneurs randomly from the sample of the baseline survey and trained them together in the same classroom. The seven pre-selected participants will be treated with special attention in the analysis below.

When we invited the 60 entrepreneurs to the training program, we explained that the program was not related to any financial assistance to them. Nonetheless, many of the participants expected to receive low-interest credits, according to our informants. They were disappointed to learn that such credits would not be extended to them, but they continued to attend class and became increasingly enthusiastic about learning more about management toward the end of the program.[7]

The training program cost about USD 40,000, which included the hiring cost of the instructors, the cost of teaching-material production, the cost of the instructors' travel from Accra to Kumasi and accommodation expenses, and the cost of renting the venue. The cost of selecting the instructors and the researchers' travel expenses were not included in this amount. The venue cost was very low because we were able to use the NVTI classroom for an insignificant amount. On dividing the total cost by the number of the participants, the training cost per person stood at about USD 740 for 15 days.

A follow-up survey was conducted in November 2008, that is, about a year after the training sessions were completed. We attempted to visit the 167 firms in the sample of the baseline survey and obtained the data of 139 firms. We found that ten firms had closed down. An encouraging fact is that none of the participants had closed down, which suggests a favorable effect of the training on enterprise survival. We could not obtain the data of the 18 other sample firms. One of them refused to cooperate with our survey. We could meet neither the entrepreneurs nor their workers at the remaining 17 firms and could not be sure whether these firms were temporarily or permanently closed.[8] These 18 attritors were also in the control group, that is, they had not been invited to the training program. We will discuss possible estimation biases due to attrition in Section 4.5.

During the training program, we learned that most of the foundry men in both the treatment and control groups had received technical training from an aid agency in the same year. Another problem was that after our training program, several entrepreneurs in our sample were evicted from a prime location which they had occupied without

permission. Needless to say, the eviction had a severe impact on their businesses. In the analysis below, we use both the larger sample consisting of 139 firms (plus ten closed-down firms) and the smaller sample consisting of 113 firms (plus six closed-down firms) other than the foundries, the evicted firms, and the pre-selected participants.

4.4 Basic statistics

In the smaller sample, the treatment group consists of 47 entrepreneurs and the control group consists of 66 entrepreneurs, as shown in Table 4.2. By the treatment group, we mean those entrepreneurs invited to attend the training program. In the treatment group, there are six refusers, who did not attend the training at all or only attended the first two days. The remaining members in the treatment group are called participants. The participants attended 14.1 days on average, and the majority recorded perfect attendance. The high rates of participation and attendance are consistent with our hypothesis that entrepreneurs in survival clusters are willing to learn management practices.

The treatment group and the control group share similar background attributes. A typical entrepreneur is male, about 45 years old, from the Ashanti region, where the cluster is located, went to school for a little more than 10 years, learned the skill of the trade as an apprentice from a master of either fabrication or machining for three to four years, and

Table 4.2 Characteristics of the sample entrepreneurs in the Suame Magazine Cluster in Kumasi by treatment status

	Treatment group			Control group
	Total	Participants	Refusers	
No. of entrepreneurs	47	41	6	66
Male (%)	100	100	100	100
Age (as of 2004)	45.4	44.2	53.6	44.8
From Ashanti (%)	78.7	75.6	100	86.4
Years of schooling	10.4	10.4	10.4	10.3
Apprentice training (%)	91.5	92.7	83.3	87.9
Years of operation (as of 2004)	13.4	12.2	21.6	14.2
Machinists (%)	55.3	56.1	50.0	68.2

Note: Treatment group refers to the group of entrepreneurs who were invited to the training program.

Source: Mano et al. (2012).

has been operating his own business for nearly 14 years. Fabricators are basically welders, whereas machinists are basically lathe turners. Many workshops have both fabricators and machinists because their activities are complementary. We classify the entrepreneurs in the smaller sample into these two types—fabricators and machinists—based on the original line of work that they were engaged in when they started their businesses.

Table 4.2 shows that the refusers tended to be older than the participants. Older entrepreneurs may have had greater time costs or lower expected benefits from the training than did younger entrepreneurs. Another characteristic of the refusers is that none of them are from outside the Ashanti region. Local inhabitants would have greater involvement in extended family functions, community functions, and sideline businesses than those from other regions. If this was the case, their opportunity costs would be higher.

Table 4.3 reports the data on the adoption of recommended practices and three accounting-based indicators of business performance. The data on the situations in 2000 and 2002 are recall data collected in 2004. The

Table 4.3 Percentages of firms adopting recommended practices and their business outcomes by treatment status in the Suame Magazine Cluster in Kumasi, 2000–2008

	Treatment (1)	**Control (2)**		**Treatment (3)**	**Control (4)**
Visiting customers (%)			*Sales revenues* (GHS 1,000)		
2000	19.2	12.2	2000	83.9	93.0
2002	19.2	13.7	2002	72.1	66.5
2004	20.3	13.7	2004	60.5	50.0
2008	51.1	21.2	2008	47.6	30.4
Keeping business records (%)			*Value added* (GHS 1,000)		
2000	23.4	19.7	2000	53.9	67.3
2002	23.4	19.7	2002	42.0	46.9
2004	27.7	24.3	2004	37.2	32.3
2008	63.8	30.3	2008	30.7	31.1
Analyzing business records (%)			*Gross profit* (GHS 1,000)		
2000	14.9	12.1	2000	44.6	49.2
2002	14.9	15.2	2002	34.1	34.3
2004	21.3	15.2	2004	30.0	23.9
2008	55.3	18.2	2008	27.2	17.0

Note: Sales revenue, value added, and gross profit are in terms of the 2008 constant GHS, obtained by using the GDP deflator taken from IMF's World Economic Outlook.

left side of the table shows the percentages of the entrepreneurs who visited customers periodically, kept records, and routinely analyzed their records in the specified year. Visiting customers is not a common activity in this cluster, and the majority of the sample firms do not keep records. Even if records are kept, they are seldom reviewed or analyzed. The data on the adoption of production management practices are not shown in the table because we could not obtain useful data. This is because few nonparticipants understood our questions about production management.

After the training, the percentage of firms in the control group keeping records increased by only 6 percentage points whereas the increase was 36 points in the treatment group. Similarly, the adoption rates of the other two practices (i.e., keeping and analyzing records) increased much more in the treatment group than in the control group. These results indicate that the training had strong impacts on the adoption of the recommended practices. Another noteworthy point is that well over one-third of the firms in the treatment group did not adopt the recommended practices. The variance of each adoption variable within the treatment group increased after the training because the variance of the dummy variable increases as the mean approaches 0.5.

The right side of Table 4.3 reports the data on annual sales revenue, value added, and gross profit by treatment status. Gross profit here is defined as sales revenue minus material cost and labor cost. Because the majority of firms did not keep records, we estimated these financial variables by asking each entrepreneur about the number of pieces sold and their prices by product type, material inputs and material prices, payments to subcontractors, and payments to workers and apprentices. We checked that the estimate of gross profit was consistent with the entrepreneur's earnings, investment, living expenses, purchase of durable goods, and so on.[9] Written records, whenever available, were used deliberately, taking into account that entrepreneurs might have their own unique concept of costs and that their calculation might be incorrect.

The trend of declining profitability is visible in Table 4.3. Some respondents said definitively that this trend was set by the proliferation of competitors within the cluster, and that it was being worsened by massive imports of similar products from Asia and increasing competition with similar clusters in the country. Decreases in sales, and gross profits after the training were somewhat smaller for the treatment group than for the control group. These differences in the mean values are small but suggest that the training had favorable effects.

The training seems to have impacts on equipment investment as well. Note that Table 4.4 shows investment amounts in GHS, whereas

Table 4.4 Real equipment investment before and after the training program in the Suame Magazine Cluster in Kumasi by type of occupation and treatment status

	Fabricators			Machinists		
	Treatment (1)	**Control (2)**	***p*-value (3)**	**Treatment (4)**	**Control (5)**	***p*-value (6)**
2006	154.8	40.5	0.276	197.3	487.2	0.386
2007	108.1	39.5	0.263	258.1	299.6	0.201
2008	135.5	217.6	0.621	905.0	174.4	0.047

Source: Mano et al. (2012).

Table 4.3 shows the sales, value added, and gross profit in GHS 1,000, which was almost equivalent to USD 1,000 in 2008. The median investment amount in each year is zero, that is, the majority in each year undertakes no equipment investment. Although the average of the investments by the fabricator control group is relatively high in 2008, the magnitude is not impressive for equipment investment even by the standard in the cluster. Sizable investments were undertaken by three machinist participants, who purchased machine tools. As a result, the difference in investment between the treatment and control groups of machinists became significant at 5 percent level after the training, as shown in Table 4.4. Another sizable investment was undertaken by a fabricator participant, who relocated his workshop to a better-conditioned site outside the cluster and installed new machines. This is not reflected in the data because it took place a few months after the follow-up survey.

4.5 Estimation

4.5.1 Specification

In this section, we estimate the average effects of the training on the participants' survival, their business performances, and their adoption of recommended business practices. Let Y_{1i} be the outcome that firm i will have if its entrepreneur participates in the training, and let Y_{0i} be the outcome that he will have if he does not receive the training. If D_i is a dummy variable that is equal to 1 for participants and 0 for non-participants, the average effect of the training on the participants may be given by $E(Y_{1i}|D_i = 1) - E(Y_{0i}|D_i = 1)$ or $E(Y_{1i} - Y_{0i}|D_i = 1)$. By definition,

$E(Y_{0i}|D_i = 1)$ is hypothetical and unobservable, but it will be equal to an observable value, $E(Y_{0i}|D_i = 0)$, if the participants are randomly selected. Note, however, that although the invitation was randomized, participation was not, and that the invited participants themselves decided whether to participate or not.

To cope with self-selection biases and to take advantage of the randomization in the invitation, we resort to the framework of the local average treatment effect (LATE). In this framework, a key role is played by the dummy variable Z_i that is 1 if the entrepreneur i was invited to the training and 0 otherwise. Obviously, D and Z are closely associated because only the invited entrepreneurs could participate in the training. Let D_{1i} and D_{0i} be the values of D_i when $Z_i = 1$ and when $Z_i = 0$, respectively. LATE is the average treatment effect on those whose treatment status is affected by random assignment (i.e., invitation in our case) and defined by

$$\text{LATE} = E[Y_{1i} - Y_{0i} \,|D_{1i} \neq D_{0i}]. \tag{1}$$

Imbens and Angrist (1994) show that if Y_{1i}, Y_{0i}, D_{1i}, and D_{0i} are independent of Z_i and if $D_{1i} \geq D_{0i}$, for all i (monotonicity),

$$\text{LATE} = \text{Cov}(Y_i, Z_i)/\text{Cov}(D_i, Z_i), \tag{2}$$

where Y_i is the outcome actually observed for firm i.

Since all the participants in our program were invited, D_{0i} is 0 and D_{1i} is either 0 or 1. Those invited entrepreneurs with $D_{1i} = 0$ are the refusers and those with $D_{1i} = 1$ are the participants. Thus, $D_{1i} \neq D_{0i}$ in equation (1) means that entrepreneur i will participate in the training if invited, and LATE in our case is equivalent to $E[Y_{1i} - Y_{0i}|D_i = 1]$, that is, the average training effect on the participants. It is easy to show that the monotonicity condition is satisfied in our case. Equation (2) implies that LATE can be estimated as coefficient β in a regression model, $Y_i = \alpha + \beta D_i + \varepsilon_i$, by using Z_i as an instrumental variable (IV). Following the lead of Frison and Pocock (1992) and McKenzie (2012), we use the Analysis of Covariance (ANCOVA) regression, which may be written

$$Y_{iA} = \alpha + \beta D_i + \theta Y_{iB} + X_{iB}\gamma + \varepsilon_i, \tag{3}$$

where Y_{iA} is the post-training outcome, Y_{iB} is the average of the outcomes in the pre-training years, namely 2000, 2002, and 2004, and X_{iB} is a vector of the entrepreneur's background attributes measured in the year 2004, which are almost all time invariant. The use of random assignment, Z_i, as an IV allows us to obtain a consistent estimate of β.

4.5.2 Estimation results

In the estimation of equation (3), the first-stage regression has D_i on the left-hand side and the instrument, Z_i, and the controls X_{iB} on the right-hand side. The qualitative results of the first-stage regression are the same regardless of whether the larger or smaller sample is used and can be summarized briefly. Since D_i and Z_i are closely correlated, Z_i has a highly significant coefficient. Consistent with Table 4.2, the age variable and the Ashanti dummy variable have negative and significant coefficients. No other variables have significant coefficients in the first-stage regressions.

The second-stage regression results are reported in Tables 4.5 to 4.8. Table 4.5 shows the results concerning enterprise survival. After the training program, two foundry men, four fabricators, and four machinists stopped operation and exited the cluster. It is remarkable that they all belonged to the control group and that none of the training participants stopped operation. This means that we cannot employ the probit model. Instead, we employ the linear probability model to check the statistical significance of the coefficient on the instrumented D_i. In this model, Y_{iA} is a dummy variable equal to unity if the firm was operating at the time of follow-up survey and zero otherwise, and the lagged dependent variable Y_{iB} on the right-hand side of equation (3) is unity for all *i*.

The results of such a two-stage regression are qualitatively the same regardless of whether the larger or the smaller sample is used. Table 4.5 reports the results obtained by using the smaller sample. The estimated effect is positive and significant at 1 percent level in column (1) and at 5 percent level in columns (2) to (5). Participation in the training program increases the probability of survival by 8 or 9 percentage points. Although not reported in the table, the estimate of the survival effect is greater and has a higher significance level if the larger sample is used.

Columns (2) to (5) include as controls the dummy variables indicating whether the firm had adopted the recommended business practices even before the training. The estimation results indicate that the firms that had kept records of transactions even before the training program were more likely to survive than other firms. Columns (3) to (5) include one of the accounting-based indicators of business performance before the training program, but none of these indicators have significant coefficients. Contrary to our expectation, the entrepreneur's schooling has a negative and marginally significant coefficient in every column.

Table 4.6 reports the estimated effects of the training on the participants' adoption of the recommended practices and their performance indicators. These estimates are obtained by using the larger sample

Table 4.5 The instrumental variable (IV) estimates of the linear probability model of survival in the Suame Magazine Cluster in Kumasi

	(1)	(2)	(3)	(4)	(5)
Instrumented D_i	0.0951***	0.0868**	0.0912**	0.0880**	0.0903**
	(0.037)	(0.035)	(0.036)	(0.035)	(0.036)
Lagged visiting customers	—	0.0362	0.0309	0.0346	0.0337
		(0.025)	(0.026)	(0.025)	(0.025)
Lagged record keeping	—	0.0905**	0.0884**	0.0911**	0.0896**
		(0.042)	(0.039)	(0.040)	(0.040)
Lagged record analysis	—	–0.0248	–0.0359	–0.0316	–0.0349
		(0.039)	(0.038)	(0.038)	(0.038)
Lagged sales revenue	—	—	–0.0003	—	—
			(0.000)		
Lagged value added	—	—	—	–0.0002	—
				(0.000)	
Lagged gross profit	—	—	—	—	–0.0005
					(0.000)
Machinist	0.0209	0.0048	0.0185	0.0140	0.0200
	(0.043)	(0.043)	(0.051)	(0.051)	(0.049)
Age	0.0021	0.0020	0.0019	0.0020	0.0020
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
From Ashanti	–0.0272	–0.0227	–0.0225	–0.0210	–0.0201
	(0.023)	(0.025)	(0.025)	(0.025)	(0.024)
Years of schooling	–0.0184*	–0.0205*	–0.0178*	–0.0193*	–0.0183*
	(0.011)	(0.011)	(0.009)	(0.010)	(0.009)
Apprentice training	–0.0246	–0.0251	–0.0210	–0.0244	–0.0249
	(0.057)	(0.057)	(0.056)	(0.057)	(0.056)
Years of operation	0.0017	0.0019	0.0021	0.0020	0.0020
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Intercept	0.9840***	0.9731***	0.9927***	0.9844***	0.9943***
	(0.123)	(0.127)	(0.121)	(0.122)	(0.117)
R-squared	0.103	0.130	0.138	0.132	0.135

Notes: The dependent variable is unity if the firm was operating at the time of the follow-up survey and zero otherwise. The number of observations is 119. Numbers in parentheses are robust standard errors. *Significant at 10% level, **at 5% level, and ***at 1% level.

without taking into account the closed-down firms and other attrition cases. The dependent variables in the first three columns are the dummies indicating whether the recommended practices were adopted. In the last three columns, the dependent variables are sales, value added, and gross profit, which are not logarithmic but in 1,000 GHS units. The estimated average effects of the training on the participants' adoption of the three recommended practices are positive and highly significant as shown in the first three columns. Note, however, that these effects are not

Table 4.6 The IV estimates of the training effects on the participants in the larger sample (ANCOVA) in the Suame Magazine Cluster in Kumasi

	Visiting customers (1)	Record keeping (2)	Record analysis (3)	Sales revenue (4)	Value added (5)	Gross profit (6)
Instrumented D_i	0.2442***	0.3543***	0.4220***	11.3451	8.9618	4.2305
	(0.067)	(0.071)	(0.069)	(13.602)	(8.190)	(7.835)
Average lagged Y_i	0.8268***	0.7372***	0.8185***	0.2247	0.0504	0.0634
	(0.050)	(0.052)	(0.064)	(0.150)	(0.076)	(0.096)
Machinist	0.0515	–0.1336*	–0.0832	3.8699	16.3252**	13.9937*
	(0.065)	(0.071)	(0.066)	(11.210)	(7.431)	(7.183)
Foundry	0.0463	0.2356**	0.1575	20.8639	23.5250	6.4294
	(0.092)	(0.110)	(0.099)	(41.747)	(18.849)	(17.765)
Age	–0.0022	–0.0023	–0.0017	–0.9824**	–0.7391**	–0.6837**
	(0.003)	(0.003)	(0.003)	(0.499)	(0.310)	(0.308)
From Ashanti	0.0901	0.2317***	0.1904***	–18.2328	–9.1312	–9.7587
	(0.071)	(0.062)	(0.065)	(21.287)	(13.129)	(12.619)
Years of schooling	0.0127*	–0.0004	–0.0034	–5.7568**	–2.6470	–2.5289
	(0.007)	(0.013)	(0.012)	(2.719)	(1.818)	(1.831)
Apprentice training	0.0157	–0.1306	–0.0275	–19.9928	–12.6750	–13.8110
	(0.079)	(0.099)	(0.084)	(21.403)	(17.657)	(17.924)
Years of operation	0.0040	0.0001	–0.0003	–0.3699	–0.2386	–0.1934
	(0.003)	(0.003)	(0.003)	(0.549)	(0.288)	(0.275)
Intercept	–0.1174	0.2585	0.0920	161.2306***	93.3041**	89.9934**
	(0.177)	(0.217)	(0.198)	(60.084)	(43.315)	(44.054)
R-squared	0.503	0.474	0.518	0.194	0.174	0.127

Notes: The number of observations is 139. Numbers in parentheses are robust standard errors. *Significant at 10% level, **at 5% level, and ***at 1% level.

Table 4.7 The IV estimates of the training effects on the participants in the smaller sample (ANCOVA) in the Suame Magazine Cluster in Kumasi

	Visiting customers (1)	Record keeping (2)	Record analysis (3)	Sales revenue (4)	Value added (5)	Gross profit (6)
Instrumented D_i	0.2861***	0.3703***	0.3944***	17.8675	13.8858*	13.4647*
	(0.084)	(0.080)	(0.081)	(12.208)	(8.339)	(7.974)
R-squared	0.496	0.534	0.540	0.140	0.145	0.134
Heterogeneous effects						
(1) Line of business						
Instrumented D_i	0.2254*	0.5527***	0.4507***	16.4637	8.9997	9.6859
	(0.126)	(0.141)	(0.137)	(14.111)	(9.079)	(8.987)
Instrumented (machinist × D_i)	0.099	–0.300*	–0.093	2.318	8.052	6.242
	(0.159)	(0.176)	(0.174)	(21.551)	(14.916)	(14.404)
(2) Age						
Instrumented D_i	0.7521**	0.4705	0.9757***	40.2946	49.1621	49.6076
	(0.338)	(0.339)	(0.298)	(63.628)	(38.980)	(37.765)
Instrumented (age × D_i)	–0.0106	–0.0023	–0.0132*	–0.5085	–0.8012	–0.8201
	(0.008)	(0.008)	(0.007)	(1.298)	(0.737)	(0.714)
(3) Years of schooling						
Instrumented D_i	–0.2289	–0.3797	–0.3419	66.8643*	45.1309*	49.6244**
	(0.242)	(0.410)	(0.375)	(38.697)	(23.470)	(22.966)
Instrumented (schooling × D_i)	0.0507**	0.0735*	0.0722**	–4.8034	–3.0635*	–3.5459*
	(0.023)	(0.040)	(0.036)	(3.216)	(1.853)	(1.832)

Notes: The number of observations is 113. Numbers in parentheses are robust standard errors. *Significant at 10% level, **at 5% level, and ***at 1% level. Although not reported here, these regressions controlled for the machinist dummy, age of the entrepreneur, the Ashanti dummy, years of schooling, experience of apprentice training, and the number of years of operation of the firm.

Table 4.8 Bounds for the IV estimates of the effect of the training program on the participants (ANCOVA) in the Suame Magazine Cluster in Kumasi

	Visiting customers (1)	Record keeping (2)	Record analysis (3)	Sales revenue (4)	Value added (5)	Gross profit (6)
Approach I						
Lower bound	0.0560	0.1587*	0.1558*	–10.5153	–3.5338	–4.6008
	(0.092)	(0.086)	(0.090)	(13.736)	(9.081)	(8.958)
Upper bound	0.3226***	0.4187***	0.4210***	27.9109**	18.7591**	17.9136**
	(0.082)	(0.082)	(0.082)	(12.848)	(8.268)	(8.048)
Approach II						
Lower bound	0.2444***	0.3184***	0.3507***	18.6051	13.1175	12.9273
	(0.082)	(0.080)	(0.081)	(12.682)	(8.196)	(7.986)
Upper bound	0.2969***	0.3758***	0.4008***	22.8463*	15.3746*	15.0786*
	(0.082)	(0.081)	(0.082)	(12.726)	(8.205)	(7.997)
Approach III						
Lower bound	0.2602***	0.3356***	0.3657***	19.8774	13.7946*	13.5727*
	(0.081)	(0.080)	(0.081)	(12.690)	(8.195)	(7.986)
Upper bound	0.2812***	0.3586***	0.3858***	21.5740*	14.6974*	14.4333*
	(0.082)	(0.081)	(0.081)	(12.707)	(8.199)	(7.991)

Notes: The number of observations is 136 for the bounds analyses. Numbers in parentheses are robust standard errors. *Significant at 10% level, **at 5% level, and ***at 1% level. Although not reported here, these regressions controlled for the machinist dummy, age of the entrepreneur, the Ashanti dummy, years of schooling, experience of apprentice training, and the number of years of operation of the firm.

homogeneous because one-third to half of the participants did not adopt these practices as shown in Table 4.3.

The estimated coefficients on the instrumented D_i are positive but insignificant in the last three columns. These estimated coefficients are not large compared with the large standard errors, but their economic magnitudes are not small. For example, the coefficient in the gross profit equation is the estimate of $E(\pi_{1i} - \pi_{0i}|D_i = 1)$, which can be viewed as the pecuniary private benefit of the training per participant in the first year following the training. The hypothetical gross profit π_{0i} can be regarded as the opportunity cost. If the effect is felt in the years ahead, $E(\pi_{1i} - \pi_{0i}|D_i = 1)$ is only a part of the private benefit. In contrast, the training cost of USD 740 per participant is a one-time cost. The estimated one-year benefit of GHS 4,230 is very large compared with this cost. However, this estimate is statistically insignificant.

The larger sample, which is used in producing Table 4.6, includes the entrepreneurs who attended another training program, which included similar training contents, and those evicted entrepreneurs whose businesses suffered great damage. Although these entrepreneurs are more or less evenly distributed across the treatment and control groups, their inclusion in the sample may lead to an underestimated effect of the training on business performance. Suppose that participation in our training program and participation in another training program are equally effective in improving business performance. Suppose further that these two programs are largely substitutes rather than complements, and, hence, the effect of participation in both programs on performance is not much stronger than the effect of participation in either one. If this is the case, the inclusion of the entrepreneurs who participated in another program in the sample will weaken the estimated effect of our training program. Similarly, if the eviction nullified the effects of the training, we would underestimate the effects by including the evicted entrepreneurs in the sample.

If such is the case, the exclusion of the entrepreneurs who participated in another training program and of the evicted entrepreneurs will lead to greater estimates of the training effects. We thus used the smaller sample to estimate the same model as above and report the estimated effects of the training on the adoption of the recommended practices and performance indicators in the first three columns of Table 4.7. Except for column (3), the coefficient on the instrumented D_i is greater in Table 4.7 than in Table 4.6. While the two tables do not differ much in the estimated effects on the adoption of the recommended practices, they do in the estimated effects on the accounting-based performance

indicators. The estimated effects on value added and gross profit are statistically significant in Table 4.7. The estimated coefficient on gross profit indicates that the private benefit of the training in the first year is 13,400 GHS, which is about 18 times the training cost.

While the effects on sales revenue and gross profit are insignificant and significant, respectively, in Table 4.7, Berge et al. (2011) find that a similar business training program increased sales revenue but not profit margin. A possible explanation why our training program had a stronger effect on gross profit than on sales revenue is that our training put emphasis on improvements in production management, especially the reduction of waste. The training program studied by Berge et al. did not have a module on production management. Another possible explanation is that while all the participants in our training program were manufacturers, the majority of the participants in the training program studied by Berge et al. were engaged in commerce.

4.5.3 Heterogeneous effects

How heterogeneous are the treatment effects? We examined the heterogeneous effects of training by inserting interaction terms of D_i with the variables representing the entrepreneur's background attributes, such as age and education, in turn. We find a significant difference in treatment effects between different groups only in the following three cases (see the second panel of Table 4.7). When D_i is interacted with the machinist dummy, the treatment effect on record keeping turns out to be weaker for the machinists than for the fabricators, even though the difference in the treatment effect is only marginally significant. Probably, this result reflects the fact that record keeping was much more common among the machinists than among the fabricators. When D_i is interacted with age, it is found that the treatment effect on the record-analysis outcome is slightly weaker for older entrepreneurs than for younger entrepreneurs. This is probably because less-experienced young entrepreneurs had not noticed the usefulness of analyzing transaction records.

Clearer heterogeneous effects are found when the D_i dummy variable is interacted with the years of schooling. More highly educated participants were more likely to begin visiting customers, and keeping and analyzing records. Probably, educated participants would tend to begin keeping the names and mobile phone numbers of customers so that they could visit the customers, and their math skills would help them keep and analyze transaction records. However, the effects of the training on the accounting-based measures of business performance are

lower for more educated participants. Since more highly educated entrepreneurs tend to employ and train a greater number of workers and apprentices, these results suggest that an improvement in business performance is more difficult for larger firms than for smaller firms. Although the training program introduced the participants to *Kaizen*, which provides useful clues as to how workers can be motivated to adopt new practices, there might not have been enough time to explain such details.

4.5.4 Attrition bias and bounds tests

Attrition is one of the sources of potential estimation bias. As noted above, ten sample firms closed down. Among the other 18 attritors, one refused to cooperate with our survey, 11 were found operating when we visited them a year later, and six were missing even on our revisit. Thus, the 11 firms were temporarily closed, and the six firms might be permanently closed. Although these 18 attritors seem to have performed poorly, we examined if these attritors were the most successful firms or if they were slightly more successful than the average, by using the bounding approach of Karlan and Valdivia (2011) to construct lower bounds for the treatment effect.

The lower (upper) bound for the treatment effect shown in the first panel entitled Approach I in Table 4.8 is developed by assuming that the attritors' outcomes were equal to the outcome of the most (least) successful firm in the observed control group. It is remarkable that even the lower bounds on the treatment effects on record keeping and record analysis are positive and significant, while the lower bounds on the treatment effects on the accounting-based measures of business performance are negative and insignificant. In Approaches II and III, the lower and upper bounds are computed under more modest assumptions that the attritors' outcomes are the mean plus (and minus) 0.25 standard deviations and 0.1 standard deviations, respectively, of the observed control distribution. In these approaches, even the lower bounds on the treatment effects on the adoption of the recommended practices are highly significant, and those on business performance are positive and marginally significant.

4.5.6 Spillovers and market stealing

In industrial clusters, knowledge spills over quickly. According to our respondents, the training participants talked to other entrepreneurs about their impressions of the program, the instructors, and the

outline of the training contents. Knowledge spillovers would reduce the estimate of the training impacts as spillovers improve the business results of the control group, which in turn reduce $\mathrm{Cov}(Y_i, Z_i)$ in equation (2).

As Bloom et al. (2007) point out, the firms' productivity improvement can affect other firms' performance through market stealing as well as spillovers. The first module of our training program encouraged the participants to be proactive in getting new customers. A few participants told us that soon after the training, they began issuing invoices and receipts on which their mobile phone numbers were printed, and they believed that the invoices and receipts had doubled their sales compared with the previous year. Their sales may have increased at the cost of other firms' sales. The market-stealing effect would overstate the training effects on the participants by worsening the business results of the control group.

The impacts of spillovers and market stealing may or may not be strong. Knowledge does not affect business results if it is not put into practice. As shown in Table 4.3, the control group's adoption rates in 2008 increased only slightly in contrast to the significant increases among the treatment group in the same year. Furthermore, not all the adopters would successfully assimilate the practices that they adopted. Market stealing by a participant would worsen the business results of the other participants as well as the non-participants, and these negative effects could cancel each other out.

4.5.7 Psychological effects

The increases in the control group's adoption rates of improved management practices in 2008 may also be attributed to a psychological effect. It is only human to show that one is doing well, even if this involves some pretense. In the follow-up survey, some entrepreneurs may have exaggerated how well their firms were doing. Moreover, the control group may have been loath to admit that they had failed to benefit from the training program. It is not difficult to imagine that some of them exaggerated not just the adoption of the recommended practices but also their business results. The follow-up survey data on the participants may have a similar problem. The participants may have been tempted to please us by exaggerating their benefits from the training program. Such a problem may not be very serious in our case; however, since we visited the entrepreneurs at their workshops to conduct the survey, observed their products, and asked them to show us their business records, if they kept any.

4.6 Conclusions

As in the rest of the world, there are a number of industrial clusters in SSA, but unlike clusters in other regions, most of these clusters have not yet achieved successful industrial development. Their low performances have been attributed exclusively to external factors, such as poor infrastructure and unfavorable governance. By contrast, problems within firms have seldom been scrutinized. Based on a randomized controlled experiment in Ghana, this study demonstrates that entrepreneurs in a survival cluster are unfamiliar with business practices which are standard in developed countries and some other developing countries. It also indicates that participation in a rudimentary management training program improves business practices substantially and unambiguously but its effect on the quantitative performance is considerably different. Although we should be cautious about generalization, these results are highly consistent with the results of earlier studies in Latin America. It seems safe to conclude that entrepreneurs in developing countries can improve the productivity of their MSEs by learning improved management techniques.

In earlier studies, the estimated training effects were economically large but statistically insignificant or only marginally significant. Our results suggest that such weak estimates come from large variations among the participants in terms of their own inherent abilities and educational levels and their workers' abilities and motivation. Probably, entrepreneurs' managerial abilities are more difficult to improve than workers' skills. Unlike vocational training, a management training program may improve the managerial abilities of only a few participants. Nonetheless, it may be worth providing from the social welfare point of view. This is because the quality-improvement phase of industrial development is led by a few innovative entrepreneurs, and their success contributes to the overall social welfare through increasing awareness of the value of training as well as imitation by many other entrepreneurs.

The results of this paper warrant considerable further research. The longer-term training effects should be examined in the future. Our conjecture is that only a small number of participants will continue to improve their business performance based on the knowledge acquired in the training. Another direction to explore is to provide advanced training. By providing elementary training, we have confirmed that entrepreneurs in the survival phase know little about management. Advanced training will allow us to explore what factors help industrial clusters enter the quality-improvement phase successfully.

5
Improved Performance of Small but Trained Firms in a Metalworking Cluster in Nairobi, Kenya[1]

5.1 Introduction

This chapter attempts to assess the impacts of teaching the very basics of *Kaizen* to owners of small enterprises has on their business performance. This experiment was conducted in a metalworking cluster in Nairobi, Kenya. In this cluster, Sonobe et al.'s (2011) observational study found that the enterprises varied considerably in the way they were operated. At some enterprises, more than ten workers worked in an orderly fashion while keeping their workshops neat and tidy. Such enterprises expanded the size of their operation within several years, and a few of them moved to more spacious industrial areas. In the same cluster, however, stagnant enterprises abound. They failed to profit even from seemingly lucrative orders for their products or machining services because the mishandling of materials, injuries, machine breakdowns, and other problems occurred with surprising frequency at their workplaces. Based on these observations, we designed our training program featuring the basics of *Kaizen*, so that owners of small enterprises could learn how to motivate every worker to participate in workplace housekeeping to improve productivity, safety, and product quality.

Assessing the impacts of teaching *Kaizen* is not new. Bloom et al. (2013) report the substantial impacts of teaching lean management practices, which overlap considerably with *Kaizen*, at 14 plants of 11 textile firms around Mumbai, India, employing 100 to 1,000 workers on their business performance. As is mentioned in Chapter 1, Gebrehiwot (2013) reports the strong impacts that teaching *Kaizen* had on the business performance of the 30 largest manufacturing firms in and near Addis Ababa, Ethiopia. These training programs dispatched a number of management consultants based in the USA and Japan to plants of the

treated firms and lasted for more than two years. Our study examines whether even a much smaller-scale *Kaizen* training program can have favorable impacts on the performance of small enterprises. In our training program, which is similar to the one in Kumasi, Ghana (see Chapter 4), 3 management consultants from Ghana and Kenya taught 34 business owners in a classroom for only 2.5 hours a day for 13 days.

This study of management training differs from existing ones in a few other respects as well. First, while many existing studies look at the impacts of training on microfinance clients operating in various business sectors, all the enterprises in our sample were located in a geographically small cluster and engaged in metalworking activities. Second, our sample enterprises were more heterogeneous in terms of enterprise size and they include self-employed persons and small enterprises employing more than 20 workers. The average number of employees was 4.3 before the training program and 5.4 after the program. While training participation was obligatory or recommended by microfinance institutions in some of the preceding training experiments focusing on microfinance clients, it was freely self-selected in our training program.

Our original plan was to select a number of business owners randomly to invite to the training program and let them choose whether to participate in it. Just before getting started, however, this plan was abandoned because post-election violence broke out after the presidential election held in December 27, 2007. The interior of the Kariobangi Light Industries, our study site, was peaceful during the crisis, but the cluster was close to the scene of mayhem. We postponed the program twice, and finally implemented it in April 2008. We also had to skip the initially scheduled enterprise survey. Instead we decided to use the data that we collected in 2006 as the baseline. We had initially intended to hold training sessions in the evening but instead held them during the daytime for security reasons. Because business owners were busier during the day than at night, we gave up the initial randomization scheme, which would have resulted in very few participants. Thus we invited all the business owners in our baseline sample to participate in the training program.

The free self-selection into the daytime training sessions led to a low take-up rate of 34 participants out of the 85 invited business owners, while the average take-up rate for the experimental training programs including those for microfinance clients was about 65 percent, according to the excellent review of these studies by McKenzie and Woodruff (2012). The participants tended to be owners of smaller enterprises in terms of sales revenues and those with experience of working at large

formal-sector factories and with experience in participating in other training programs. These observations suggest that those who had lower opportunity (or time) costs and were aware of the value of learning new knowledge tended to participate in our training program. The combined effects of the training itself and the self-selection on value added and profits are positive and significant even after the unobservable fixed effects of business owners are controlled for, while the combined effects on sales revenues are insignificant. The results remain qualitatively similar when the self-selection effect is mitigated by employing the difference-in-difference propensity-score matching (DID-PSM) method, which will not control for potential differences in unobservables correlated with the choice to participate in the training program. By contrast, the participation in other training programs in the past is found to increase sales revenues, not value added or profits. These results suggest that the participants made efforts to reduce wasted materials and activities following the *Kaizen* training.

Section 5.2 describes our study site and training program. Section 5.3 presents the empirical results concerning the factors associated with self-selection into participation, participants' attendance, and their test scores. Section 5.4 presents the empirical results concerning the impacts of the training on business performance and management practices. Section 5.5 discusses implications for future research and policies.

5.2 Kariobangi Light Industries and the *Kaizen* training program

Our study site is near a large slum area in Nairobi and is called the Kariobangi Light Industries. The local government designated this area as a place for artisans' light manufacturing activities in 1989 but did not provide infrastructure (Sonobe et al., 2011). Its development dates from the early 1980s when the workers of formal-sector factories lost jobs as a consequence of the implementation of the Structural Adjustment Program and moved to this area. They cleared the bush to construct roads and established garages and workshops. They call themselves *Jua Kali* in Swahili, meaning informal-sector artisans.[2] Many of their businesses are informal, but some are formally registered and employ as many as 20 workers.

We have studied the development of this cluster since 2004. In 2006, we conducted an enterprise survey for 127 firms to collect data on the educational and occupational backgrounds of owners, production and

costs, marketing information in 2000, 2002, and 2005, and on the number of employees in these years and in 2006. Using these data, Sonobe et al. (2011) find that more educated business owners were more likely to deal with quality-conscious customers, such as international organizations, NGOs, and government bodies, and tended to have higher rates of employment growth than their less-educated counterparts. The same data set reveals that profits and enterprise sizes were larger for business owners with higher education.

These results remain unchanged, even if the effects of different product lines or categories are controlled. Of the 127 enterprises surveyed, 85 were engaged in metalworking, such as the production of flourmills, scale balances, steel furniture, and bolts and nuts, and the remaining 42 enterprises were engaged in hardware retailing, car-repair services, soap making, printing, and other miscellaneous activities. Within each category of products, enterprises varied considerably in business performance, even though they were located in the same place.

While the positive association between business owners' educational backgrounds and their business performance seems robust, what education represents is unclear. It can be the person's human capital, but it can also be his or her financial wealth and extensive network or social capital. Moreover, the positive association between education and business performance accounts for only a very small part of the variation in business performance across the enterprises producing similar products in the same industrial cluster.

Firstly, we found that about half the sample enterprises did not keep records of transactions or inventory, like many micro-entrepreneurs in Sri Lanka as described by de Mel et al. (2009). They were not sure whether they were making profits or losses. Whether to keep records or not may be a matter of habit rather than knowledge. Still, proper training should help participants grasp the importance of keeping records of transactions and inventory. Drexler et al. (2014) find that a simplified rule-of-thumb training in record keeping has favorable impacts on the performance of micro-entrepreneurs.

Secondly, we found that the majority of the business owners in our sample did not separate their business and household finances. Karlan and Valdivia (2011) find that a training program that taught, among other things, how to separate money between the business and the household increased the business income of microfinance clients. Thirdly, many of the business owners in our sample could not characterize who their good customers were. They had paid little attention to customer needs probably because they were unaware of the basics of marketing.

Berge et al. (2012) as well as Karlan and Valdivia (2011) report that learning basic marketing helped microfinance clients expand their businesses. The basics of record keeping and marketing are also core subjects of Start/Improve Your Business (SIYB) and Business Edge management training programs provided in a number of developing countries by the *International Labour Organization* (ILO) and International Finance Corporation (IFC), respectively.

Although not emphasized in the existing studies of management training experiments, there is another problem commonly observed at almost every workplace. It is the problem of motivating workers to pay attention to productivity, quality control, and machinery maintenance. For example, workshops and warehouses littered with broken machines and waste materials prevent workers from working quickly and smoothly, increase the risk of injury, and disappoint visitors who might otherwise offer loans or become customers. As another example, workers waste time in searching for tools because they do not make a point of putting the tools away after they finish using them. Thus, workplace housekeeping is an important factor associated with business performance. We saw several business owners failing to motivate their workers to keep their workplaces neat and tidy. Similarly, we often heard from business owners that they had to give up their plans to produce higher-quality products by using higher-quality materials or machinery because their rough workers would have spoiled such expensive materials and machinery. These owners believed that they could not motivate workers to pay attention to housekeeping, proper work procedures, or machinery maintenance.

Experts in *Kaizen* maintain that *Kaizen* helps to motivate workers to pay attention to these aspects of business operation so as to improve productivity and product quality (e.g., Imai, 1997). *Kaizen* and lean manufacturing are commonly practiced in East Asia and North America. As mentioned earlier, Gebrehiwot (2013) and Bloom et al. (2013) present evidence of the favorable impacts of extensive training programs teaching *Kaizen* or lean manufacturing to large firms in developing countries.

Few attempts, however, have been made to assess the impacts of *Kaizen* training on small enterprises, even though *Kaizen* training has been an important ingredient of a large number of technical aid projects that the Japanese aid agency has implemented in various parts of the world. An exception is a randomized controlled trial (RCT) in Ghana, reported in Chapter 4. In this program in Ghana, 5 days (or 12.5 hours in total) were devoted to lectures on the basics of *Kaizen*, and the

remaining ten days were used to teach the basics of marketing, business planning, and record keeping. The impacts of the program on business performance were assessed to be positive and marginally significant. The present study was initially intended to replicate this RCT in Kenya by hiring the same team of instructors consisting of two Ghanaians and one Kenyan. One Ghanaian instructor received *Kaizen* training in Japan.

5.3 Participation, attendance, and understanding

Our original plan was to conduct an enterprise survey just before providing the training program. Not all the invited persons would participate in the program and, thus, we would be able to examine factors associated with self-selection into participation and to assess the intention-to-treat (ITT) effects and the local average treatment effects (LATE) of the training. As mentioned earlier, however, the post-election violence forced us to delay the training program and shorten the period of training from 15 days to 13 days and from 2.5 hours a day to 2 hours a day. The violence also forced us to abandon the enterprise survey and to offer the training sessions during the daytime. Consequently, we had to use our 2006 survey data as the baseline and expected a very low take-up rate. We decided to give up randomization and focus on the largest possible group of relatively homogeneous entrepreneurs within our sample. Thus, we invited all the 85 metalworking entrepreneurs in the sample to the training program. This means that we cannot assess the ITT effect or the LATE of the program.

The timeline for the surveys and the training program is as follows. The baseline survey was conducted in September 2006 and data were collected on the operation of the sample enterprises in 2000, 2002, and 2005 as well as the educational and occupational backgrounds of the entrepreneurs. The training program was implemented for 13 weekdays from Wednesday, April 23, 2008 to Friday, May 9, 2008. The follow-up survey was conducted in December 2008 to collect data of the 85 metalworking enterprises on their operation during the post-training period from June to November 2008. In the follow-up survey, we also collected recall data on the pre-training situation in 2006 and 2007 as well.

Table 5.1 summarizes the background characteristics of the experiment subjects by participation status. In our definition, business owners are regarded as participants if they attended the training program for more than seven days. There were 39 business owners who attended the program at least one day, but five of them stopped showing up after the second or third day. The remaining 34 persons recorded high rates

of attendance. The training was conducted in a classroom. Although the instructors made short visits to 16 participants' workshops, the main purpose of the visits was to become familiar with the environments of the Kariobangi cluster and the way in which the enterprises operated, not to give suggestions to the participants.

As the first two lines of Table 5.1 show, the 34 participants and 51 non-participants share about the same ages and years of schooling. On average, they were in their late 30s as of 2005 and had almost 12 years of education.[3] The participants differ significantly from the non-participants in other respects, however. Nearly 80 percent of the participants and 51 percent of the non-participants worked at large factories in the formal sector before they started their businesses in Kariobangi. The difference is statistically significant at the 1 percent level. From our impression, business owners with this kind of work experience tended to be more knowledgeable about production technologies used in modern factories operated by Indians or Europeans.

While 27 percent of the participants had attended other training programs in the past, only 6 percent of the non-participants had such a learning opportunity. These training programs were mostly short-term standard business training programs, not including a *Kaizen* element, held by international organizations and NGOs. According to our interview with a successful businessman, participation in a training program almost a decade ago boosted his business so that his metalworking factory had to be moved from Kariobangi to a more spacious and convenient industrial area.

Table 5.1 Characteristics of the sample entrepreneurs in the Kariobangi Light Industries in Nairobi by participation status as of 2005

	Participants (1)	**Non-participants (2)**	***p*-value for H_0: (1)–(2)=0**
Number of observations	34	51	
Age	39.5	36.4	0.112
Years of schooling	12.0	11.7	0.694
Work experience in the formal sector (yes = 1)	0.79	0.51	0.008***
Other training program participation (yes = 1)	0.27	0.06	0.007***
Years of operation	10.6	7.4	0.026**

Note: ***Significant at 1% level, **at 5% level.

Source: Own surveys.

The last line of Table 5.1 shows that the participants had operated their businesses significantly longer than the non-participants. Thus, the participants were more experienced in the operation of their own businesses and had more opportunities to see and hear about modern technology and management than the non-participants.

These differences between the participants and non-participants are reflected in the estimated probit model of the self-selection into participation as shown in column (1) of Table 5.2. The coefficients on age and schooling are insignificant, while the coefficients on the formal-sector experience dummy and the participation in another training dummy are positive and significant. While the coefficient on the years of operation is insignificant in column (1), it is positive and marginally significant in column (2), in which sales revenue in 2005 is added, even though it is admittedly endogenous, to control to some extent for the effects of unobservable capability and opportunity costs. The inclusion of sales revenue here is intended to capture the opportunity cost or time cost of business owners because they would be busier if they were operating a larger business. This result is robust as it is not altered if the sales revenue

Table 5.2 Correlates with *Kaizen* management training participation in the Kariobangi Light Industries in Nairobi

	(1)	(2)
Entrepreneur's age	–0.0003	–0.0006
	(–0.02)	(–0.03)
Years of schooling	–0.05	–0.04
	(–1.13)	(–0.76)
Work experience in the formal sector	0.76**	0.91***
	(2.24)	(2.54)
Other training participation	0.96**	1.07**
	(2.44)	(2.48)
Years of operation	0.04	0.05*
	(1.36)	(1.65)
Sales revenue in 2005 (million KES)		–0.002**
		(–2.32)
Intercept	–0.75	–0.76
	(–0.90)	(–0.89)
LR chi-squared	18.03***	22.61**

Notes: This table shows the estimated probit model of participation in the training program. The number of observations is 85. Entrepreneur's age, the years of operation, and the other training participation dummy used in this table are the values as of 2007. The numbers in parentheses are *z*-values. LR, likelihood ratio; ***Significant at 1% level; **at 5% level; and *at 10% level.

in 2005 is replaced by the sales revenue in other years or by the number of workers or the value added.

A possible interpretation of the positive coefficient on the years of operation is that highly experienced business owners tend to have developed a kind of receptivity to welcome any potentially useful opportunity, which comes around. Another interpretation would be that enterprises operating for longer years are more willing to learn standard management techniques, preparing to move to formal industrial areas and expanding their business. As the number of years of operation becomes greater, however, the enterprises becomes larger and the owners become busier, which makes it more difficult for them to participate in the training program. In column (1), the insignificant coefficient on the years of operation may reflect the mixture of these two effects working in the opposite directions. This is why the significance and magnitude of this coefficient increase slightly with the inclusion of the enterprise size as a proxy of time cost.

Another possible interpretation is that owners of larger enterprises did not find it very useful, or simply did not like, to attend the training program which the instructors clearly stated was about basic management skills, because such owners thought they had already acquired basic management skills or because of their great pride. In any case, the owners of larger enterprises were less likely to participate in the training, and they tended to have longer experience in operating businesses.

The positive coefficients on the formal-sector experience and the training experience suggest that those business owners with these experiences tend to think that training participation is useful for their businesses. These business owners, however, tend to operate larger enterprises than those without formal-sector end training experiences, and the operation of larger enterprises would make the owners busier and less willing to participate in the training program. Thus, the inclusion of the enterprise size in the regression as a control is expected to increase the magnitude of the positive coefficients on these experience variables. Consistent with this expectation, the significance level and magnitude of these coefficients increase if the enterprise size is included as shown in column (2). To sum up, business owners with formal-sector experience, training experience, and longer experience in management and operating relatively small enterprises were more likely to participate in the training program.

The program consisted of three modules: the first module explained entrepreneurship, business planning, and marketing (three days); the second module was about basic *Kaizen* toward production management

and quality management (five days); and the third module emphasized record keeping and explained how to begin paying value added tax (five days). The first module was originally planned to last for five days but was shortened to three days. The participants took a short test designed to measure the degree of understanding training contents at the end of each module. We rented a large room of a run-down restaurant in the Kariobangi cluster as the classroom. It had no air conditioner and was surrounded by small workshops emitting loud sounds of hammering. Still, the three instructors who had extensive experience in adult learning managed to keep the participants from being bored. The attendance rates of the 34 participants were distributed from 77 percent to 100 percent, and the average was 94.9 percent. Their test scores were distributed from 47.0 to 93.3 out of 100 and the average was 69.1.

Table 5.3 reports the results of regressions linking the attendance rates and test scores to their background characteristics. In the regression equation explaining the attendance rate, the work experience in the formal sector is the only variable that has a significant coefficient except for the intercept.[4] The participants with such an experience skipped

Table 5.3 Correlates with attendance and test score in *Kaizen* management training in the Kariobangi Light Industries in Nairobi

	Attendance rate		**Test score**	
	(1)	**(2)**	**(3)**	**(4)**
Entrepreneur's age	–0.07	–0.07	–0.33	–0.34
	(–0.40)	(–0.39)	(–1.22)	(–1.24)
Years of schooling	0.18	0.19	1.75**	1.89**
	(0.41)	(0.41)	(2.63)	(2.69)
Work experience in the formal sector	–6.55**	–6.70*	–4.70	–5.23
	(–2.05)	(–1.97)	(–0.97)	(–1.03)
Other training participation	–0.64	–0.71	4.67	3.32
	(–0.22)	(–0.22)	(1.04)	(0.69)
Years of operation	–0.15	–0.15	–0.18	–0.18
	(–0.66)	(–0.63)	(–0.53)	(–0.50)
Sales revenue in 2005 (million KES)		0.28		–0.29
		(0.21)		(–0.15)
Intercept	102.4***	102.1***	65.5***	65.7***
	(11.58)	(11.01)	(4.87)	(4.75)
R-squared	0.15	0.15	0.35	0.37

Notes: This table focuses on the 34 participants. The dependent variable in columns (1) and (2) is the number of days attended as a percentage of the total number of training days, while that in columns (3) and (4) is the test score in the percentage of the full score. The numbers in parentheses are *t*-values. ***Significant at 1% level, **at 5% level, and *at 10% level.

some classes probably because they thought they already knew the class content. The insignificant but negative coefficient on the same variable in the test score regressions indicates that these participants did not do well on the short tests. The good performers on the tests were those participants with higher education. This is probably because the test on record keeping included math questions or because such participants were used to multiple-choice tests.

5.4 Impacts of the training program

Our experiment is not an RCT. It is difficult to assess the average treatment effect of the treated (ATT), the most accepted measure of the treatment effect, because self-selection bias will remain even though we apply DIDs and propensity matching. Moreover, there may be bias due to some psychological effects that will be discussed shortly. In this section, we attempt to examine the impacts of the training program while keeping these problems in mind.

Table 5.4 presents the data on the accounting-based indicators of business performance in the upper panel and the data on the adoption of recommended practices in the lower panel. In our enterprise surveys, we used a short and highly focused questionnaire, which was filled out by one of our coauthors or our well-trained enumerator while coaxing answers from business owners in about one hour on average. A possible problem with the accounting-based indicators is that many enterprises did not keep accounts. We estimated the sales revenues, material costs, and other costs by carefully asking such business owner about the number of pieces sold and their prices by product type, material inputs and material prices, payments to subcontractors, and payments to workers. If the same material was used or the same product was produced by two enterprises or more in our sample, we confirmed the consistency of the material prices or the product prices that they quoted. We believe our estimates are reasonably accurate because we checked that the estimate of gross profit was consistent with the entrepreneur's earnings, investment, living expenses, purchase of durable goods, and so on, and also because we deliberately used written records, whenever available, taking into account that each entrepreneur might have his or her own unique concept of costs and that his or her calculation might be incorrect. Data were collected in this way by one of our coauthors in the 2006 baseline survey and by the enumerator under his close supervision in the 2008 survey. The two data sets may differ in accuracy, but such difference, if any, will not be large for particular types of enterprises but, by and large, common to all the enterprises in the sample.

Table 5.4 Mean business results and percentage of sample enterprises that have adopted recommended practices by participation status in the Kariobangi Light Industries in Nairobi, 2000–2008

	Business results (per month, 1,000 constant KES in 2000)					
	Sales revenue		Value added		Gross profit	
	Participants (1)	Non-participants (2)	Participants (3)	Non-participants (4)	Participants (5)	Non-participants (6)
2000	153.5	261.1	72.2	118.6	41.6	93.2
2002	126.8	226.4	49.7	104.1	26.1	81.4
2005	135.1	195.1	53.7	95.8	28.1	65.1
2006	117.4	154.0	51.7	73.2	37.7	54.6
2007	120.4	180.0	50.6	69.4	35.2	45.0
2008	162.2	182.1	76.4	60.9	61.0	38.0
	Adoption of practices (% of the entrepreneurs)					
	Keeping records		Reviewing records		Setting in order	
	Participants (7)	Non-participants (8)	Participants (9)	Non-participants (10)	Participants (11)	Non-participants (12)
2000	26.9	32.1	23.1	35.7	15.4	46.4
2002	35.3	37.2	26.5	27.9	20.6	32.6
2005	45.4	54.0	39.4	52.0	30.3	42.0
2006	55.9	61.2	50.0	57.1	41.2	46.9
2007	61.8	64.0	55.9	60.0	41.2	54.0
2008	85.3	72.5	79.4	68.6	73.5	62.7

Source: Own surveys.

Our 2006 survey produced the estimates of sales revenue, value added, and gross profit (= value added minus labor cost) in 2000, 2002, and 2005, while our 2008 survey produced estimates of these variables in 2006, 2007, and 2008.[5] In general, a heavy dependence on recall data is a source of trouble in empirical studies. In our inference analyses, we attempt three sets of analysis: the first set uses data on business performance in 2005 and 2008; the second set uses those in 2000, 2002, 2005, and 2008; and the third set uses all the data. In the next section, we will report the results of the second and third sets of analyses because the first set is qualitatively very similar to the second set. The upper panel of Table 5.4 shows the deflated monthly values of these variables.

It is clear from this table that business results were getting worse from 2000 to 2007. This is a result of the flood of imports from Asia, which were cheap and had good finishing. Probably market competition was also increasing because producers of similar products were increasing in and around Kariobangi, which is an indication of quantity expansion. From 2000 to 2007, the participants had consistently lower averages in these business performance indicators than the non-participants. This is why the results shown in Tables 5.2 and 5.3 were not essentially altered if the sales revenue in 2005 on the right-hand side was replaced by the sales revenue in other years or the other financial variables. Another interesting point is that the ratio of value added to sales revenue and the ratio of gross profit to value added went down from 2000 to 2007 for both the participants and the non-participants. These observations are consistent with the view shared by both the participants and non-participants that product prices relative to material prices were declining and labor costs were soaring.

For the non-participants, the downward trend in profitability continued in 2008. While their sales revenue in 2008 stayed at the same level as in the previous year, their value added and gross profits declined. Although not reported in the table, their average number of employees increased slightly in 2008, which might mean that some of them seriously miscalculated profitability and expanded production. By contrast, the participants increased sales revenues and achieved high profitability, exceeding past performance. Among the participants, those that attained higher test scores in the training program tend to perform especially better in business.[6] If we take the DIDs between the participants and the non-participants, the increase in gross profits for the participants was greater than that for the non-participants by (61.0 – 35.2) – (38.0 – 45.0) = 32.8. This relative increase amounts to more than 90 percent of the participants' average gross profit in 2007.

We are, however, concerned about a possible bias due to the Hawthorne effect or the psychological effect arising from the excitement associated with being selected into participation. The participants might be willing to exaggerate the favorable impacts of the treatment they received. Although we do not think it was easy for them to exaggerate business results in 2008 because we checked the validity of our estimates of business results persistently, it might be easy to lead us to underestimate their business results in 2006 and 2007, about which our check was less persistent. During our 2006 survey, we ourselves had no intention to conduct an experiment and, hence, the data collected at that time were not biased. Therefore to mitigate the possible influence of the Hawthorne effect, DIDs may be taken between 2005 and 2008. Then, the relative increase in gross profits of the participants is (61.0 – 28.1) – (38.0 – 65.1) = 60.0, which is even larger than the previous measure. Overall, both the participants and the non-participants show similar trends in business results from 2000 to 2007. In 2008 the participants reveal off-trend improvement in business results, while the non-participants continue to follow the previous trend.

It is easy to imagine that the non-participants wanted to demonstrate that they did not miss out on the benefit of a useful training program by exaggerating their performance (the John Henry effect). The non-participants with such an intention would lower our estimates of their business performance in 2007 and 2006 because they would find it more difficult to exaggerate their performance in 2008. In any case, the difference in the estimated business performance between 2008 and 2007 (or 2006) can be biased upward, while the difference in the estimated performance between 2008 and 2005 is less likely to be biased. If both the participants and the non-participants exaggerated their growth performance, however, the DIDs comparing 2008 and 2007 may or may not be greater than the DIDs comparing 2008 and 2005, depending on which group exaggerated more greatly.

Note that even if the DIDs may not be biased in this way, it includes the self-selection effect and cannot be regarded as the impact of the training program itself. The participants would decide to participate in the training because they anticipated benefiting from it. We think that they could have the correct anticipation about the benefit from the training because they had read the flyer explaining the contents of the training and because they could choose whether to participate in the training after attending a few classes. Actually there were five non-participants who attended one or two sessions, as mentioned earlier. Thus, we expect that the self-selection effect included in the DIDs is non-negligible.

Thus, the seemingly better business performance of the participants relative to the non-participants may be a result of a self-selection effect, recall bias, and psychological effects as well as the effects of the training program itself. Our data do not clearly indicate that the psychological effects are strong or that the recall bias is serious. As to self-selection, however, we have already seen in Table 5.3 that the statistical association between some variables and participation is highly significant. Moreover, we expect that some unobservable talents of business owners will be associated with both training participation and business performance after the training program. Thus, the self-selection effect may explain a large part of the relatively good performance of the participants. Note, however, that the self-selection effect cannot be realized without the training program.

We turn to the data on the adoption of three recommended practices shown in the lower panel of Table 5.4. The first is to keep records of transactions and inventory. The second is to review records to detect abnormalities and to make business plans. The third is to set in order, or to designate locations at which materials are stored or to which tools are returned after being used. During our 2006 survey, we did not formally gather information on these practices but just made casual observations at each sample enterprise. When we conducted our 2008 survey, the data on these practices were constructed from the respondents' answers to the question of when they adopted each of these practices. The collected information on management practices is reasonably consistent with our casual observations during the 2006 survey.

We are concerned about biases in the practice adoption data due to the social desirability bias as well as to the Hawthorne effect. The fact that we asked about these practices would suggest to our respondents that we thought the adoption of these practices was desirable. It seems natural that they were tempted to answer these questions in a manner that would be viewed favorably by us. Like our estimates of business performance in 2008, the data on the adoption of practices as of 2008 are relatively reliable because we directly observed the practices on site by visiting the sample enterprises. However, the adoption rates in the earlier years can be greatly exaggerated. Among the participants, those who achieved higher test scores were likely to adopt the recommended practices.[7]

Table 5.5 reports the estimated random-effects and the fixed-effects models of the determination of the business results. The random-effects model may be written as

$$y_{it} = \beta_0 + \beta_1 P_i \times Year08 + \beta_2 P_i + X_i \gamma + \lambda_t + u_i + \varepsilon_{it},$$

Table 5.5 Random-effects estimates of the impacts of the training program on real sales, value added, and gross profits per month (1,000 constant KES in 2000) in the Kariobangi Light Industries in Nairobi

	Sales revenue		Value added		Gross profit	
	(1)	(2)	(3)	(4)	(5)	(6)
Participant × Year 2008	28.17	33.23	44.87**	54.34**	51.10**	63.31**
	(0.92)	(0.87)	(2.20)	(2.22)	(2.38)	(2.48)
Participant	–141.3***	–145.0***	–58.67***	–64.13***	–49.61***	–60.05***
	(–3.00)	(–3.03)	(–2.80)	(–2.76)	(–2.59)	(–2.65)
Years of schooling	8.99	9.58	3.31	4.09	1.58	2.65
	(1.40)	(1.49)	(1.17)	(1.32)	(0.61)	(0.88)
Work experience in the formal sector	112.9**	125.4***	52.57**	57.07**	53.17***	59.60***
	(2.36)	(2.63)	(2.51)	(2.52)	(2.80)	(2.71)
Other training participation	112.3***	114.3**	10.27	5.65	–3.07	–3.18
	(3.29)	(2.54)	(0.51)	(0.22)	(–0.16)	(–0.13)
Entrepreneur's age	0.84	0.37	0.56	0.31	0.08	–0.24
	(0.31)	(0.14)	(0.47)	(0.24)	(0.08)	(–0.19)
Years of operation	6.96*	5.68	2.61	1.56	2.00	1.11
	(1.84)	(1.50)	(1.57)	(0.87)	(1.32)	(0.64)
Year 2002	–5.01	–6.33	–7.97	–10.28	–5.20	–7.38
	(–0.22)	(–0.24)	(–0.53)	(–0.61)	(–0.33)	(–0.42)

Year 2005	–8.81	–10.56	–6.12	–9.483	–9.97	–13.24
	(–0.39)	(–0.40)	(–0.41)	(–0.57)	(–0.64)	(–0.76)
Year 2006	–45.29**		–21.45		–12.78	
	(22.41)		(–1.44)		(–0.82)	
Year 2007	–32.61		–24.11		–19.01	
	(–1.44)		(–1.61)		(–1.21)	
Year 2008	–27.08	–31.05	–36.62**	–43.14**	–33.00*	–40.95**
	(–1.04)	(–1.00)	(–2.13)	(–2.17)	(–1.83)	(–1.97)
Intercept	–7.83	0.026	7.475	13.06	18.92	23.17
	(–0.07)	(0.00)	(0.15)	(0.23)	(0.40)	(0.43)
Fixed-effect estimates:						
Participant × Year 2008	26.28	26.28	52.18**	52.18**	62.63**	63.31**
	(0.69)	(0.69)	(2.11)	(2.11)	(2.43)	(2.48)
Hausman test c^2 [*p*-value]	2.25	8.44	0.70	0.83	0.70	0.08
	[0.95]	[0.133]	[1.00]	[0.975]	[0.99]	[1.00]

Notes: The number of observations is 466 in columns (1), (3), and (5), and 299 in columns (2), (4), and (6). The numbers in parentheses are *z*-values for random-effects estimates and *t*-values for fixed-effects estimates, both based on robust standard errors. ***Significant at 1% level, **at 5% level, and *at 10% level.

where the dependent variable y_{it} is the outcome (i.e., sales revenue, value added, and gross profit) of enterprise i in year t, P_i is a dummy variable indicating whether or not the owner of enterprise i participated in our training program, *Year*08 is the year dummy for 2008, X_i is a vector of the (time-invariant) characteristics of the owner i, β_t is the year effect, u_i is the unobservable individual effect, and u_{it} is an error term. The training impact is measured by coefficient β_1, the coefficient on the interaction between the participation dummy and the 2008-year dummy.

In the corresponding fixed-effects model, one can estimate β_1 but not β_2 or γ because variables P_i and X_i are time-invariant. Table 5.5 primarily reports the estimated random-effect model. The fixed-effects estimate of β_1 is presented in the second to the last row. According to the results of the Hausman test, as shown in the last row, the coefficients of the random- and fixed-effects models are not systematically different. Note, however, that both random- and fixed-effects estimation may be inconsistent because the self-selection into participation may relate the participation dummy P_i (and hence the interaction term $P_i \times$*Year*08 as well) to not only u_i but also the error term ε_{it}. The specification in columns (1), (3), and (5) uses the full set of data and includes five-year dummies, while the specification in columns (2), (4), and (6) focuses on years 2000, 2002, 2005, and 2008 to make the estimates more immune from the possible bias due to the psychological effects discussed above.[8]

The first row of Table 5.5 shows the estimates of β_1. The first two columns indicate that the impact of the training program on sales revenue is positive but insignificant. By contrast, the next four columns indicate that the impacts on value added and gross profit are significant at the 5 percent level. The estimated impact on gross profit shown in column (6) is about the same as the DIDs that we calculated above. Both for value added and gross profit, the estimated impacts are smaller if the 2006 and 2007 data are included. This suggests that the non-participants might exaggerate their growth performance more greatly than the participants.

The coefficients on the participant dummy are negative and highly significant across the columns, indicating that the participants had smaller enterprise sizes than the non-participants.[9] These results are consistent with the estimated probit model of self-selection into participation (Table 5.2). The coefficients on the schooling variable are insignificant but positive. By contrast, the formal-sector dummy has significant coefficients, pointing to the usefulness of work experience in the formal sector in business operation.

An interesting result is that the other training participation variable has a positive and highly significant coefficient in the sales revenue regression but not in the value added or profit regression. This pattern of

significance stands in contrast to that of the key coefficient β_1. These contrasting results lend strong support to our hypothesis that a training program teaching *Kaizen* will help enterprises reduce waste in intermediate inputs and wasted time and effort, which is a neglected aspect of management in conventional training programs emphasizing increases in output and sales.

An alternative approach to estimate the training impacts with panel data is to use the lagged dependent-variables model. In the labor economics literature, it is well-known that the earnings histories of participants in labor training programs in the USA typically exhibit a pre-program dip (e.g., Ashenfelter, 1978; Ashenfelter and Card, 1985). The lagged dependent-variables model is employed to deal with the pre-program dip (Abadie et al., 2007; Angrist and Pischke, 2009). We applied this model to our data even though the business performance of the participants in our training program did not show a pre-program dip but was persistently declining and worse than the performance of the non-participants throughout the period before the training program, as shown in Table 5.4. The results were qualitatively similar to the results shown in Table 5.5.

Table 5.6 presents the results of the random-effects model estimation of the training effects on the adoption of recommended practices. Although we have to be cautious in interpreting the results because of the social desirability bias, three findings seem noteworthy. First, the coefficient on the interaction between the participation dummy and the year 2008 dummy is significant in every column. Second, this interaction has a particularly large and significant coefficient in the last two columns, indicating that the training encouraged the adoption of one of the essential housekeeping practices. Third, the schooling variable and the other training participation variable have significant coefficients only in the regressions of record keeping and analysis as shown in the first four columns, not in the *Kaizen* practice. These results lend further support to the hypothesis that the *Kaizen* training improves an important but neglected aspect of management.

Finally, we report in Table 5.7 as well as Table 5A and Figures 5.A1 and 5.A2 in the Appendix the results of applying the DID-PSM method (Heckman et al., 1997, 1998; Rosenbaum and Rubin, 1983; Smith and Todd, 2005).[10,11] Although there are variants of matching methods available in the literature, Smith and Todd (2005) present suggestive evidence for the advantage of local-linear matching over standard kernel matching methods.[12] We employ local-linear regression matching, an extension of local-linear matching that adjusts for the remaining difference in the covariates between the participants and the matched non-participants based on the local-linear regression (Heckman et al., 1997).[13]

Table 5.6 Random-effects estimates of the impacts of the training program on the adoption of recommended practices in the Kariobangi Light Industries in Nairobi

	Keeping records		Analyzing records		Setting in order	
	(1)	(2)	(3)	(4)	(5)	(6)
Participant × Year 2008	0.14**	0.14*	0.14***	0.14*	0.22***	0.25***
	(2.00)	(1.77)	(2.00)	(1.71)	(2.84)	(2.93)
Participant	–0.05	–0.05	–0.19	–0.12	–0.17*	–0.19*
	(–0.49)	(–0.55)	(–1.18)	(–1.43)	(–1.71)	(–1.99)
Years of schooling	0.04***	0.04***	0.04***	0.04***	0.004	0.01
	(3.66)	(3.77)	(3.54)	(3.68)	(0.31)	(0.72)
Work experience in the formal sector	0.05	0.02	0.14	0.13	0.09	0.09
	(0.58)	(0.21)	(1.52)	(1.47)	(0.081)	(0.90)
Other training participation	0.17**	0.16*	0.12*	0.14	0.07	–0.01
	(2.20)	(1.92)	(1.58)	(1.55)	(0.91)	(–0.11)
Entrepreneur's age	–0.004	–0.002	0.003	0.003	–0.004	–0.002
	(–0.74)	(–0.36)	(0.51)	(0.60)	(–0.75)	(–0.36)
Years of operation	–0.01	–0.01	–0.01	–0.003	0.01	0.01
	(–1.40)	(–0.92)	(–1.03)	(–0.43)	(1.16)	(1.20)
Year 2002	0.02	0.04	–0.04	–0.02	–0.005	–0.001
	(0.40)	(0.81)	(–0.67)	(–0.29)	(–0.11)	(–0.02)

Year 2005	0.19***	0.20***	0.18***	0.20***	0.10**	0.10**
	(3.66)	(3.76)	(3.72)	(3.75)	(2.32)	(2.13)
Year 2006	0.26***		0.25***		0.15***	
	(5.17)		(5.03)		(3.55)	
Year 2007	0.30***		0.29***		0.20***	
	(5.89)		(5.78)		(4.44)	
Year 2008	0.39***	0.40***	0.37***	0.38***	0.29***	0.29***
	(6.70)	(6.33)	(6.47)	(6.03)	(5.30)	(4.75)
Intercept	–0.01	–0.097	–0.28	–0.317	0.35	0.23
	(–0.05)	(–0.47)	(–1.34)	(–1.58)	(1.50)	(1.01)
Fixed-effects estimates:						
Participant × Year 2008	0.13*	0.13	0.14*	0.13	0.21**	0.24**
	(2.00)	(1.62)	(2.07)	(1.64)	(2.37)	(2.39)
Hausman test c^2 [*p*-value]	†	2.84	1.34	1.50	3.91	2.47
		[0.724]	[0.99]	[0.91]	[0.79]	[0.78]

Notes: The number of observations is 466 in columns (1), (3), and (5), and 299 in columns (2), (4), and (6). The numbers in parentheses are *z*-values for random-effects estimates and *t*-values for fixed-effects estimates, both based on robust standard errors. ***Significant at 1% level, **at 5% level, and *at 10% level. † indicates that the asymptotic assumptions of the Hausman test are not met.

Table 5.7 DID-PSM estimates of training effects in the Kariobangi Light Industries in Nairobi

	Sales revenue (1)	Value added (2)	Gross profit (3)	Keeping records (4)	Analyzing records (5)	Setting in order (6)
(1) Difference between 2007 and 2008	53.10* (1.90)	59.83* (1.93)	57.83* (1.86)	0.18** (2.26)	0.18** (2.40)	0.30*** (4.09)
(2) Difference between 2005 and 2008	14.99 (0.29)	73.25* (1.68)	89.14** (2.08)	0.20* (1.77)	0.28*** (3.36)	0.30*** (3.83)

Notes: The local linear regression matching method developed by Heckman et al. (1997, 1998) was used to match participants and non-participants. Row (1) looks at DID comparing values in 2007 (before the training) and 2008 (after the training), while row (2) compares values in 2005 (before the training) and 2008 (after the training). The propensity score used in row (1) comes from the estimated probit model reported in column (1) of Table 5.2, while that in row (2) uses the propensity score based on the same model as in column (1) of Table 5.2 except that it uses the entrepreneur's age and the years of operation as of 2005. ***Significant at 1% level, **at 5% level, and *at 10% level.

The first step of this method is to calculate the PSM based on the estimated probit models similar to those reported in Table 5.2. We estimated two probit models: the first is exactly the same as the model in column (1), and the second model does not control sales revenues but uses the entrepreneur's characteristics as of 2005. The first probit model is intended to obtain DID propensity scores in the case in which outcomes in 2007 and 2008 are compared.[14] The second model is intended to compare outcomes in 2005 and 2008.[15] The second step is to check the validity of matching, which is done in the Appendix.

Table 5.7 shows the results of the DID-PSM estimation of the training impacts on business performance and the adoption of practices. This table has two rows corresponding to the two models just mentioned above and six columns corresponding to three indicators of business performance and three practice-adoption rates. According to these rows, the impacts of the training on business performance are positive and generally significant, and the impacts on value added and profit are particularly significant. These results lend support to the hypothesis that the *Kaizen* training boosts profitability rather than sales. The estimated impacts are stronger in row (2) (i.e., when DIDs is taken between 2008 and 2005) than in row (1) (i.e., when DIDs is taken between 2008 and 2007), which is consistent with our findings from Tables 5.4 and 5.5. It is also noteworthy that the estimated impacts on the adoption of

practices are all significant as shown in columns (4) to (6), and that the magnitude of the impact on the *Kaizen* variable is larger than that on record keeping and analysis, which is consistent with the result shown in Table 5.6.

5.5 Conclusions

Recently a number of RCTs have been conducted in developing countries to estimate the impacts of basic business training on the self-employed, micro enterprises, and small enterprises with a view to providing an intellectual basis for designing effective technical cooperation. Such basic training programs usually emphasize business-planning skills, marketing skills, and financial literacy. They seldom teach even the principles of production management and quality management, including simple housekeeping rules. *Kaizen* and lean manufacturing are approaches to this neglected but important aspect of management. The impacts of extensive training programs designed to teach *Kaizen* or lean manufacturing to large enterprises have already been assessed in some recent studies. The present study is one of the few attempts that have been made to assess a small-scale, inexpensive training program that teaches basic *Kaizen* to small enterprise owners.

The estimated impacts of our training program on sales revenues are statistically insignificant, but those on value added and profits are significant and economically strong. By contrast, those business owners who received other business training in the past had significantly greater sales revenues, but their value added and profits are not significantly different from the averages. These results are consistent with our hypothesis that *Kaizen* training boosts value added and profits by reducing wasted materials and activities.

Our examination of the factors associated with self-selection into training participation suggests that the participants tended to be the business owners who attached relatively high value to knowledge and had relatively low opportunity costs of participating in the training program. In other words, it is likely that the right persons for the training participated in the very basic *Kaizen* management training program. This would be a non-negligible part of the reason why the training program had strong impacts on business performance. In order to realize the multifaceted innovations leading to the quality-improvement phase, we may have to offer more advanced management training, which may attract the interests of those who have high potential to grow and high opportunity cost of time.

Appendix: Balancing test

To see whether the matching is successful, we perform the balancing tests proposed by Dehejia and Wahba (1999, 2002), which rely on the *t*-test of equality in the mean of each covariate between the participants and the non-participants, and the pseudo-*R* squared and likelihood ratios obtained from the estimation of the probit model of participation. As shown in Table 5A, the after-matching probit models have no explanatory power. This confirms that matching is successful.

The participants and the non-participants differ in terms of entrepreneur's observable characteristics. The differences are apparent in Figures 5.A1 and 5.A2, which show the histograms of the propensity scores calculated from the probit models. If we simply compared the average performance of the participants with that of the non-participants, we would fail to isolate the effects of the training participation from the effects of the entrepreneur's characteristics. If the participants and non-participants differed completely, however, it would be impossible to estimate the counterfactual performance based on the performance of the matched

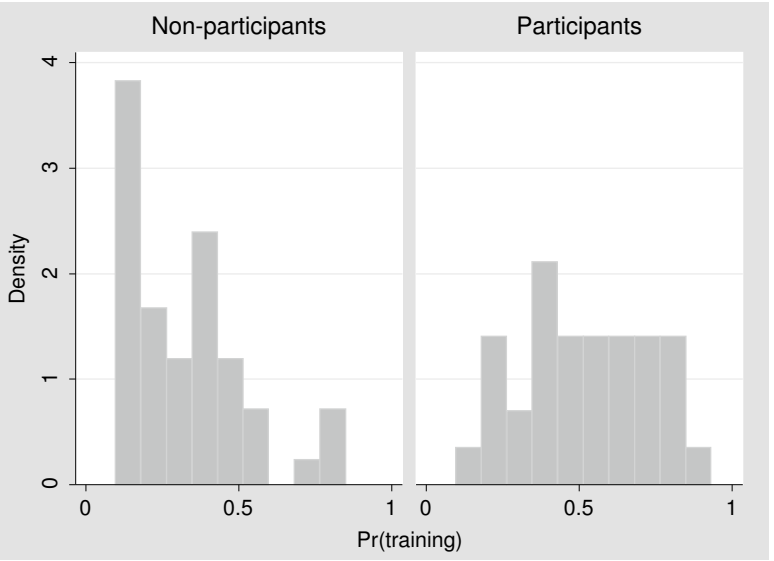

Figure 5.A1 Estimated propensity score by training participation corresponding to DID-PSM 2007–2008 reported in row (1) of Table 5.7

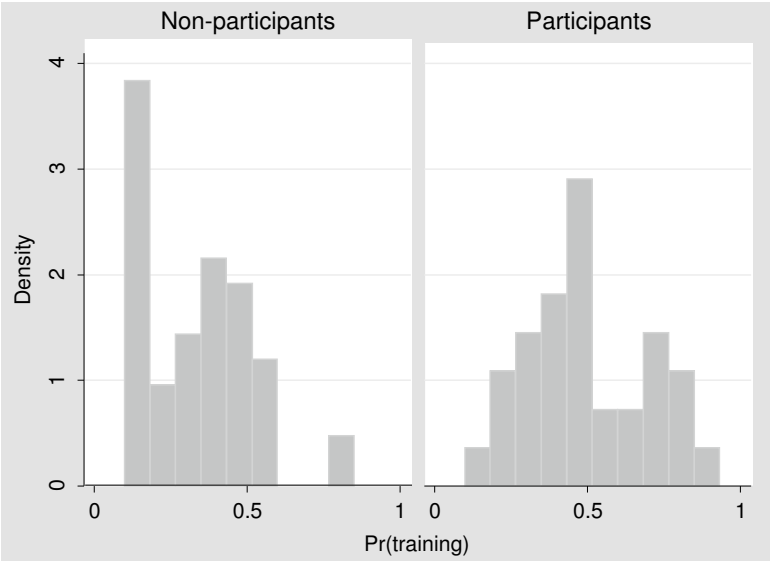

Figure 5.A2 Estimated propensity score by training participation corresponding to DID-PSM 2005–2008 reported in row (2) of Table 5.7

non-participants. Thus, the distribution of propensity score for the participants and that for the non-participants must have a common range of support, in order for the matching estimation to be feasible. Figures 5.A1 and 5.A2 clearly show that such a common support exists, and we compare only the training participants and the non-participants belonging to this support.

Table 5A Balancing test for DID-PSM in the Kariobangi Light Industries in Nairobi

	2007 as baseline			2005 as baseline		
	Participants (1)	**Non-participants (2)**	***t*-value for (1)–(2)=0 (3)**	**Participants (4)**	**Non-participants (5)**	***t*-value for (4)–(5)=0 (6)**
Entrepreneur's age	39.1	41.3	–0.98	36.9	38.1	–0.50
Years of schooling	12.1	12.9	–0.73	12.6	12.9	–0.65
Work experience in the formal sector	0.82	0.85	–0.33	0.81	0.80	0.12
Other training participation	0.36	0.31	0.48	0.22	0.22	0.01
Years of operation	11.7	13.7	–1.30	9.6	10.8	–0.73
Summary statistics for the probit model						
Pseudo R^2	0.035			0.016		
LR chi^2	3.21			1.00		
p >chi^2	0.67			0.99		

Notes: The first three columns of this table show the results of the balancing test for the DID-PSM estimation reported in row (1) of Table 5.7, and the next three columns of this table correspond to row (2) of Table 5.7. The participants and non-participants in columns (1) and (2) are matched by using the propensity score obtained from the estimated probit model reported in column (1) of Table 5.2, and those in columns (4) and (5) are matched based on the propensity score obtained from the estimated probit model with the same model as in column (1) of Table 5.2 except that it uses the entrepreneur's age and the years of operation as of 2005.

6
Effects of Classroom and On-site Training in a Metalworking Cluster in Addis Ababa, Ethiopia

6.1 Introduction

In Ethiopia, we implemented a classroom-training program and an on-site training program for entrepreneurs operating metalworking enterprises with three or more workers. The measurement of the training impacts in Ethiopia is likely to be affected by the increasingly favorable access to the knowledge of *Kaizen* due to the recent government policy of disseminating *Kaizen* as an integral part of the country's modernization. Yet, the purpose of this chapter is to analyze the impacts of classroom and on-site training on the management practices and the business performance by using the data collected through the two follow-up surveys as well as the baseline survey.

A major finding of this chapter is that both classroom- and on-site training programs increased management practice scores of the treated enterprises (i.e., those enterprises that were invited to at least one of these training programs) significantly relative to the control group. The estimated training impacts on business performance, however, are ambiguous in the difference-in-differences (DID) sense. This ambiguity may be a result of knowledge spillover, which would increase the performance of the untreated enterprises, thereby making it difficult to measure accurately the impacts on the treated enterprises. In our Ethiopia survey, unlike our Tanzania survey to be reported in Chapter 8, we did not collect data on the number of participants with whom the entrepreneur talked about the training but we have data on the number of participants with whom the entrepreneur was acquainted. The advantage of the latter approach is the fairly exogenous nature of the number of acquaintance. The latter variable is found to be associated closely with value added as well as the *Kaizen* practice score after the training programs.

This chapter is organized as follows. Section 6.2 briefly reviews the timeline of the training programs and the enterprise surveys, and the sample size. Section 6.3 presents the intention-to-treat (ITT) effects on management practices estimated by using cross section data collected soon after each of the two training programs. Section 6.4 reports the estimation results of the training impacts, followed by the conclusion in Section 6.5.

6.2 Data

6.2.1 Sample sizes

In Ethiopia, baseline surveys were conducted in September 2009 and June 2010 in Addis Ababa and its vicinity. After the classroom-training program was held in July 2010, the first follow-up survey was conducted in October 2010, which was followed by the on-site training program in December to March and the second follow-up survey in April 2011. In September 2009, we found 104 metalworking enterprises producing fabricated metal products and/or providing machining service with three or more workers in this area. One of these 104 enterprises was made into a model workshop, at which local consultants and a Japanese *Kaizen* expert, together with the entrepreneur and the workers of this enterprise, applied some *Kaizen* practices to the real operation of business. The on-site training participants could learn on their visit how the knowledge of *Kaizen* is put into practice. Another model workshop was set up in a machining shop of a public training institute. At these model workshops, the local trainers learned how to implement *Kaizen*, how to motivate the entrepreneur and workers to start and continue *Kaizen*, and other related knowledge and skills. The participants in the on-site training program were allowed to visit the model workshop to see how the knowledge of *Kaizen* was applied.

The remaining 103 enterprises were randomly assigned to one of the following four groups: Group TT consisting of 28 enterprises was invited to both the classroom training, which was similar to the ILO-type management training, and the on-site training program, which featured *Kaizen* management practices; Group TC consisting of 28 enterprises was invited to the classroom training but not to the on-site training; Group CT consisting of 23 enterprises was invited only to the on-site training; and Group CC consisting of 24 enterprises was not invited to either training program.

The take-up rate of the classroom training program was 75 percent (42 out of 56 enterprises in Group TT and Group TC), and that of the on-site training was 86 percent (44 out of 51 enterprises in Group TT

and Group CT). In each of the three groups other than Group TT, an enterprise was closed down by the time of the second follow-up survey. As follow-up survey data are unavailable for these three enterprises, and in this report, we cannot help but focus on the remaining 100 sample enterprises, for which we have both baseline and follow-up survey data.[1] While it would be interesting to examine how training participation affected the survival and closure of business, such analysis is impossible with the number of exits being as small as three.

We would like to call attention to the fact that the classroom-training program was mostly about non-*Kaizen*-type management practices, such as business planning or strategy, marketing, and record keeping, covered by ordinary business development services (BDS). Although the importance of *Kaizen* practices was emphasized in the classroom-training program, it did not explain how to motivate workers to put their ideas into action. By contrast, during the on-site training program, the *Kaizen* expert and the local consultant gave entrepreneurs practical advice as to how to start and continue *Kaizen*.

6.2.2 Management practice scores

To measure management practices, our baseline and follow-up surveys asked 22 questions, which can be classified into 10 questions related to *Kaizen* practices and 12 questions about non-*Kaizen* practices, as shown in Table 6.1. The number of positive answers to the questions about *Kaizen* practices is referred to as the *Kaizen* practice score, and its counterpart is the non-*Kaizen* practice score. They are also collectively called management practice scores. At the time of the baseline survey, the average *Kaizen* practice score among the sample enterprises was 6.26 and the non-*Kaizen* practice score was 4.88.

Table 6.2 describes the association between the management practice scores and the background characteristics of the entrepreneur. The dependent variable is the *Kaizen* score in columns (1) and (2) and the non-*Kaizen* score in columns (3) and (4). In columns (1) and (3), the regression equation is specified to include the composition of the enterprise's labor force by educational level. These regressions are intended to describe statistical association, but not to examine the causal relationship.

The coefficient on the number of years of operation is positive in columns (1) and (2), but it is negative in the next two columns. While the coefficient on the number of years of entrepreneur's schooling is insignificant in the *Kaizen* columns, it is significant at the 5 percent level in the non-*Kaizen* columns. These contrasts between the *Kaizen* and

Table 6.1 *Kaizen* and Non-*Kaizen* scores as of the baseline survey in a metalworking cluster in Addis Ababa

	Mean	(Standard deviation)
Kaizen practices (yes = 1)		
Every machine and equipment was used in the last month	0.500	(0.50)
Defectives are placed separately from others	0.630	(0.49)
Tools are always returned to their designated places	0.710	(0.46)
Materials are stocked in good order at a designated place	0.750	(0.44)
The floor is cleaned regularly	0.930	(0.26)
Machines are cleaned regularly	0.520	(0.50)
Machines are maintained at least weekly	0.810	(0.39)
Production areas are demarcated by task	0.900	(0.30)
Meetings of all production workers are held regularly	0.210	(0.41)
Records of defects are kept	0.300	(0.46)
Total *Kaizen* score (out of 10)	6.260	(1.92)
Non-*Kaizen* practices (yes = 1)		
Enterprise account and household account are separated	0.720	(0.45)
Transactions are recorded every day	0.610	(0.49)
Sales and cost summary are computed at least monthly	0.510	(0.50)
Entrepreneur refers to the summary of records to answer our question about sales and cost	0.020	(0.14)
Business cards or brochures are distributed	0.800	(0.40)
Signboard exists in front of the enterprise	0.360	(0.48)
Owners/managers can identify who their major customers are	0.350	(0.48)
Owners/managers understand the strength of their own enterprise	0.480	(0.50)
There is a sales or profit target	0.100	(0.30)
The enterprise does long-term investment planning	0.770	(0.42)
External learning opportunities are provided for workers	0.140	(0.35)
Good working environment are provided for workers	0.020	(0.14)
Total non-*Kaizen* score (out of 12)	4.880	(1.79)

Source: Own surveys.

non-*Kaizen* scores seem to reflect the fact that *Kaizen* is a practical approach to management rather than a theoretical one. Consistently, columns (2) and (4) show that the *Kaizen* score does not depend on the workers' educational level, while the non-*Kaizen* score is positively

Table 6.2 Association between background characteristics and management practice scores in the cross section as of the baseline survey in a metalworking cluster in Addis Ababa

	***Kaizen* score**		**Non-*Kaizen* score**	
	(1)	**(2)**	**(3)**	**(4)**
Years of operation	0.044***	0.041***	–0.026*	–0.026*
	(3.10)	(2.91)	(–1.88)	(–1.75)
Years of schooling	0.077	0.087	0.140**	0.141**
	(1.12)	(1.27)	(2.49)	(2.41)
Parent was in the same trade	–0.037	0.005	–0.156	–0.122
	(–0.09)	(0.01)	(–0.46)	(–0.35)
Non-Ethiopian	0.582	0.593	1.528**	1.535**
	(0.99)	(0.97)	(2.32)	(2.29)
Visited foreign countries	–0.101	–0.138	–0.236	–0.238
	(–0.19)	(–0.25)	(–0.45)	(–0.45)
Other management training participation in the past	–0.726	–0.742	0.666	0.669
	(–1.61)	(–1.61)	(1.45)	(1.45)
Number of sample entrepreneurs the respondent knew	0.004	0.002	0.034*	0.034*
	(0.19)	(0.10)	(1.87)	(1.83)
Share of workers who completed secondary education		–0.577		–0.208
		(–0.86)		(–0.33)
Share of workers who completed vocational school or university		–0.206		1.170***
		(–0.45)		(2.86)
Constant	4.609***	4.738***	2.838***	2.871***
	(5.08)	(4.95)	(3.85)	(3.83)
R-squared	0.144	0.151	0.194	0.200

Notes: The number of observations is 100. The coefficients were estimated by OLS. Numbers in parentheses are *t*-statistics. *Significant at 10% level, **at 5% level, and ***at 1% level.

associated with it. These results are consistent with the features of *Kaizen* practices described in Chapter 3, indicating that our measure of management practices captures these features well.[2]

To address the question of how closely the management practice score is associated with business performance, we ran the regression of sales revenue and value added on the management practice scores and the variables representing the characteristics of the entrepreneur. The results

are shown in Table 6.3. The coefficients on the *Kaizen* score and the non-*Kaizen* score are significant at the 5 percent and the 1 percent levels, respectively. Note, however, that we do not intend to claim any causal relationship. For example, good management practices may be a result of hiring good workers, which in turn may have been made possible by good business performance. Also it is easy to imagine that both management practices and business performance are affected by the unobservable inherent ability of the entrepreneur. What the highly significant coefficients on the management practice scores indicate is merely that the management score is closely associated with business performance.

The other significant coefficients are noteworthy as well. First, the number of years of operation is very closely associated with sales revenue and value added. Presumably this is because the long-established enterprises

Table 6.3 Association between management practice scores and business performance in the cross section as of the baseline survey in a metalworking cluster in Addis Ababa

	ln(sales revenue)		**ln(value added)**	
	(1)	**(2)**	**(3)**	**(4)**
Kaizen score	0.211**		0.173**	
	(2.42)		(2.28)	
Non-*Kaizen* score		0.291***		0.256***
		(2.96)		(2.94)
Years of operation	0.036***	0.054***	0.035***	0.049***
	(3.37)	(5.09)	(3.27)	(4.99)
Years of schooling	0.066*	0.039	0.063*	0.04
	(1.76)	(0.99)	(1.77)	(1.16)
Parent was in the same trade	–0.565*	–0.533*	–0.679**	–0.652**
	(1.93)	(1.88)	(2.43)	(2.38)
Non-Ethiopian entrepreneur	1.302*	0.953	0.679	0.352
	(1.94)	(1.39)	(1.04)	(0.53)
Visited foreign countries	–0.795*	–0.671	–0.399	–0.273
	(1.67)	(1.28)	(0.93)	(0.58)
Years of operation	0.517*	0.191	0.411	0.131
	(1.68)	(0.66)	(1.43)	(0.50)
Number of sample entrepreneurs that the respondent knew	0.061***	0.053***	0.059***	0.051***
	(5.04)	(3.83)	(6.13)	(4.87)
R-squared	0.685	0.699	0.684	0.701

Notes: The number of observations is 96. The coefficients were estimated by OLS. Numbers in parentheses are *z*-statistics. *Significant at 10% level, **at 5% level, and ***at 1% level.

tend to accumulate financial assets and practical production knowledge so that their operation sizes tend to be large compared with newly established enterprises. Second, the coefficient on the years of schooling is positive and significant in columns (1) and (3) where the non-*Kaizen* score is not included, but it is insignificant in columns (2) and (4) where the non-*Kaizen* score is included. As we saw in Table 6.2, the non-*Kaizen* score is closely associated with the entrepreneur's education. The observation that the coefficient on education loses significance when the non-*Kaizen* score is included in the regression suggests that education affects business performance largely through non-*Kaizen* management practices.

Third, the dummy variable indicating whether the parent of the entrepreneur worked in the metalworking sector has negative and significant coefficients on sales revenue and value added. About one-third of the sample entrepreneurs have fathers with work experience in the metalworking sector, and most of them were self-employed artisans operating small-scale businesses or were workers themselves. Fourth, the dummy variable indicating whether the entrepreneur is non-Ethiopian has a significant coefficient in the sales revenue regression in column (1), in which the non-*Kaizen* score is not included, but the coefficient is insignificant in the other columns. This observation, together with the result about the non-Ethiopian dummy shown in Table 6.2, suggests that non-Ethiopian entrepreneurs have greater sales revenue than Ethiopian entrepreneurs largely because the former's non-*Kaizen* practices, probably related to marketing, are superior to the latter's.

Toward the bottom of Table 6.3, the estimated coefficient on the number of other sample entrepreneurs that the respondent knew before the experiment is highly significant in every column. Probably this strong association reflects the reverse causality, that is, entrepreneurs operating successful businesses tend to have larger circles of contacts. Also the association is likely to indicate that there is an aspect of management that is not captured by our management practice scores but important for having good business performance and related to the entrepreneur's network of connections. One that comes to mind immediately is the entrepreneur's ability to finance equipment investment and expenses of procuring materials and employing labor. This ability must be an important factor associated with the size of business operation and is probably related to the network of connections. To sum up, the results shown in Tables 6.2 and 6.3 indicate among other things that the *Kaizen* score is associated with the experience of operating a business, while the non-*Kaizen* is associated with the level of education of the entrepreneur, and that these measures of management practices are positively associated with business performance.

6.3 ITT effects in cross sections

In our experiment, we randomly assigned the sample entrepreneurs into the treatment group and the control group, but some entrepreneurs did not comply with the assignment. While there were no entrepreneurs who were uninvited but participated in a training program, 14 entrepreneurs were invited but did not participate in the classroom-training program, and 7 entrepreneurs were invited but did not participate in the on-site training program. These incompliance cases amount to 25 percent of the treatment group of the classroom training and 14 percent of the treatment group of the on-site training, respectively.

In what follows, we estimate the ITT effects of the training programs. The average treatment effects on the treated (ATT) could be estimated by means of the instrumental variable method. While ATT is the difference between the outcome of the trained entrepreneurs and the hypothetical outcome that they would have had in the absence of the training, ITT captures the difference in outcomes between the invited entrepreneurs and the uninvited ones. If ATT is positive, ITT is likely to be smaller because the effect of the invitation to the training program is diluted by the decisions of non-participation by some invited entrepreneurs, who missed the opportunity to improve their performance. Still it is meaningful to measure ITT for the training program that leaves the decision on participation to the invited individuals.

In Table 6.4, the cross-section data collected immediately after each training program are used to evaluate the impact of the program on the management practice scores. Columns (1) and (2) present the estimated impacts of the classroom training on the *Kaizen* and non-*Kaizen* scores marked during the first follow-up survey, which was conducted between the classroom and on-site training programs. Columns (3) and (4) report the impacts of the two training programs on the management practice scores marked during the second follow-up survey, which was conducted after the on-site training program. Since we take the ITT approach, we compare the average score of the entrepreneurs who were invited to a training program and that of the entrepreneurs who were not invited to the program, regardless of whether they actually participated in the program.

The insignificant coefficients on Group TT and Group TC in column (1) indicate that the classroom-training program did not have a significant impact on the *Kaizen* score, while column (2) indicates that the classroom training did improve the non-*Kaizen* score significantly. These results are consistent with our concern that we did not have enough

Table 6.4 Estimated cross-section OLS model of post-training management practice scores after the training programs in a metalworking cluster in Addis Ababa

	Follow-up survey 1		**Follow-up survey 2**	
	***Kaizen* score**	**Non-*Kaizen* score**	***Kaizen* score**	**Non-*Kaizen* score**
	(1)	**(2)**	**(3)**	**(4)**
Group TT	0.289	0.835*	1.633***	1.330**
	(0.54)	(1.68)	(3.39)	(2.11)
Group TC	0.051	0.930**	0.726	0.503
	(0.10)	(2.00)	(1.52)	(0.90)
Group CT	NA	NA	1.351***	0.925
	NA	NA	(2.93)	(1.45)
Number of the training participants that the respondent knew	0.017	0.029	0.048**	0.021
	(0.81)	(1.33)	(2.09)	(0.72)
Negative shock	–1.254**	–0.110	–1.353**	0.086
	(2.14)	(0.19)	(2.56)	(0.15)
Years of operation	0.049***	–0.018	0.023*	0.014
	(3.65)	(1.10)	(1.84)	(0.71)
Years of schooling	0.075	0.098	0.013	0.183***
	(1.18)	(1.52)	(0.22)	(2.71)
Parent was in the same trade	0.207	–0.477	–0.261	–0.121
	(0.52)	(1.33)	(0.77)	(0.26)
Non-Ethiopian	0.202	0.439	–0.257	0.689
	(0.33)	(0.87)	(0.42)	(0.84)
Visited foreign countries	0.434	0.349	0.813*	0.198
	(0.94)	(0.79)	(1.79)	(0.28)
Other management training participation in the past	–0.426	1.397***	–0.658	1.785***
	(0.89)	(3.28)	(1.41)	(3.48)
Constant	4.159***	3.715***	4.737***	2.339**
	(4.24)	(4.25)	(5.76)	(2.35)
R-squared	0.281	0.234	0.348	0.308

Notes: The number of observations is 100. Numbers in parentheses are *t*-statistics. *Significant at 10% level, **at 5% level, and ***at 1% level.

time before the classroom-training program started. That is, before the training program started, the local consultants who served as instructors did not have enough time to talk with the Japanese *Kaizen* experts to deepen their understanding of *Kaizen*, and the Japanese experts did not have time to visit enterprises in Ethiopia in order to know the problems

that faced local entrepreneurs including the participants. The results shown in columns (1) and (2) are consistent also with the fact that the instructors were dexterous in teaching entrepreneurship, business planning, marketing, and record keeping, which are categorized here as non-*Kaizen* practices, that is, those issues often taken up by BDS providers.

The coefficient on Group TT in column (3) represents the total effects of the classroom- and on-site training programs on the *Kaizen* score, which is far greater than its counterpart in column (1) with the difference (i.e., 1.633–0.289) being significant. Moreover, Group CT has a positive and significant coefficient in column (3), and its magnitude is close to the difference between the coefficient of Group TT in columns (1) and (3). These results indicate that the on-site training program had a positive impact on the *Kaizen* score.

In column (4), the coefficient on Group TT is positive. Although it is greater than its counterpart in column (2), the difference between them is insignificant. The coefficient on Group CT is also positive but insignificant. Thus, the impact of the on-site training program on the non-*Kaizen* score is likely to be positive but statistically insignificant.

Note that the coefficient on Group TC in column (4) is smaller than that in column (2) in magnitude and lower in the significance level. Thus, the advantage of Group TC, which was provided only with the classroom training, over Group CC, which received neither training program, in the non-*Kaizen* score was eroded over time. Presumably this is because knowledge spilt over from the treatment group to the control group. By contrast, the coefficient on Group TC in column (3) is greater than that in column (1) in magnitude and higher in the significance level, that is, the advantage of Group TC over Group CC in terms of the *Kaizen* score increased during the same period. Are these results contradictory to each other? Probably they are not necessarily contradictory. Note that the classroom-training program was unlikely to have an impact on the *Kaizen* score. Thus, there would not be knowledge spillovers from Group TC (and Group TT) to Group CC (and Group CT). Still during or after the on-site training program, more than a few members of Group TC would talk with some participants in the on-site training program or visit a model workshop, and then they would understand better what the instructors of the classroom training had taught them about *Kaizen* in an abstract way. Although this is just our interpretation or speculation, it is easy to imagine that knowledge spilt over from the on-site training participants to Group TC in this way. It seems understandable that compared with Group TC, Group CC took much less advantage of knowledge spillovers from the on-site training participants

and the model workshops because Group CC had not learned the basics of *Kaizen* unlike Group TC.

In columns (1) and (2), the variable called "the number of training participants that the respondent knew" means the number of classroom training participants that the respondent knew before the experiment began (or the number of acquaintances who participated in the classroom training). In columns (3) and (4), it means the number of on-site training participants that the respondent knew before the experiment began. Although these estimated coefficients are insignificant in columns (1), (2), and (4), the one in column (3) is significant at the 5 percent level. These results suggest that there had been spillovers of knowledge about *Kaizen* from the on-site training participants to the non-participants in our sample.

Some enterprises in our sample faced negative shocks between our baseline survey and the second follow-up survey, such as eviction from their production sites, machine breakdowns, and other accidents that occurred in the workplace. While such negative shocks did not have significant effects on the non-*Kaizen* score, their negative impacts on the *Kaizen* score was significant. A possible reason is that while the non-*Kaizen* score is more related to the entrepreneur's skills and practices, the *Kaizen* score is more related to the practices of workers and the conditions of housekeeping within their workplace. Given such a difference between the two scores, it is not surprising that the negative shocks lowered only the *Kaizen* score.

Several other estimated coefficients are statistically significant in Table 6.4. They are coefficients on the variables representing the entrepreneur's educational background and experience in business operation. These results are qualitatively similar to the results of the regressions of the management practice scores at the time of baseline survey on the entrepreneur's background characteristics as shown in Table 6.2. More specifically, in both tables, the *Kaizen* score increases with the number of years of operation but the non-*Kaizen* score does not; the number of years of schooling is positively associated with the non-*Kaizen* score but not with the *Kaizen* score.

Toward the bottom of Table 6.4, the dummy variable indicating whether the respondent had participated in any other management training program previously has an insignificant coefficient in the equation explaining the *Kaizen* score both at the first and second follow-up surveys, as shown in columns (1) and (3), which is qualitatively the same as the results from the baseline survey, as shown in Table 6.2. These results are understandable in view of the fact that the other

management training programs did not teach *Kaizen* practices. By contrast, the same dummy variable has a highly significant coefficient in columns (2) and (4) of Table 6.4, that is, when the same variable is used to explain the non-*Kaizen* score. Note that the corresponding coefficient in Table 6.2 fell short of the 10 percent significance level. Moreover, the magnitude of the coefficient increased over time from 0.66 at the baseline survey to 1.39 at the first follow-up survey and 1.78 at the second follow-up survey. Thus, compared with the baseline and first follow-up survey data, the second follow-up survey data indicate a greater impact of the participation in other management training programs in the past on the non-*Kaizen* score.

Why did the impact of the past training program on the non-*Kaizen* score increase, while the coefficient on Group TC in columns (2) and (4) became smaller and less significant? A possible interpretation is that the prior knowledge that some entrepreneurs had acquired from some other training programs that they had attended in the past was helpful for understanding and adopting the non-*Kaizen* practices taught in our classroom and/or on-site training programs. Thus, the impact of our classroom and on-site training programs may be stronger for those participants who had also participated in other training programs in the past. The validity of this interpretation will be examined shortly with the regressions that allow heterogeneous treatment effects, of which results are reported in Table 6.7 below. Similarly, among the non-participants, those who had participated in some other management training programs in the past might benefit more from knowledge spillovers from the treatment group in our experiment.

6.4 ITT effects in panel

Tables 6.5 to 6.7 report the estimated fixed-effects models explaining the management practice scores. Each coefficient shown in column (1) is the sum of corresponding coefficients shown in columns (2) and (3). The variable named Time 2 is a dummy variable that is equal to 1 if the data are taken from the second follow-up survey and 0 otherwise. The coefficient on its interaction with Group TT indicates the ITT estimate of the combined effects of the classroom- and on-site training programs on the overall score in column (1) and the *Kaizen* and non-*Kaizen* scores in columns (2) and (3), respectively.

The variable named Time 1 is a dummy variable that is equal to 1 if the data are taken from the first follow-up survey and 0 otherwise. Its interaction with Group TC is intended to capture the ITT effect of the classroom-training program on the management practice scores under

Table 6.5 Fixed-effects model estimates of the impacts of the training programs on management practice scores in a metalworking cluster in Addis Ababa

	Overall score (0–22)	***Kaizen* score (0–10)**	**Non-*Kaizen* score (0–12)**
	(1)	**(2)**	**(3)**
Time 2 × Group TT	2.153***	1.119***	1.033***
	(4.40)	(3.05)	(2.80)
Time 1 × Group TC	0.569	0.249	0.320
	(1.18)	(0.90)	(0.90)
Time 2 × Group CT	1.540***	0.723*	0.818*
	(2.67)	(1.90)	(1.86)
Negative shock	0.020	–0.376	0.396
	(0.03)	(0.85)	(0.84)
Time 2	0.582	–0.367	0.949***
	(1.59)	(1.34)	(3.81)
Time 1	0.793***	–0.085	0.878***
	(3.96)	(0.91)	(4.77)
Constant	11.140***	6.260***	4.880***
	(86.09)	(87.16)	(49.41)
R-squared	0.298	0.082	0.329

Notes: The number of observations is 300 and the number of firms is 100. Numbers in parentheses are *t*-statistics. *Significant at 10% level, **at 5% level, ***at 1% level.

Table 6.6 Fixed-effects model estimates of the impacts of the training programs on the objectively verifiable management practice scores in a metalworking cluster in Addis Ababa

	Overall score (0–10)	***Kaizen* score (0–4)**	**Non-*Kaizen* score (0–6)**
	(1)	**(2)**	**(3)**
Time 2 × Group TT	1.145***	0.650**	0.495**
	(3.37)	(2.38)	(2.35)
Time 1 × Group TC	0.031	–0.175	0.206
	(0.10)	(0.79)	(0.94)
Time 2 × Group CT	1.105***	0.568**	0.537**
	(3.06)	(2.40)	(2.01)
Negative shock	0.050	–0.036	0.086
	(0.11)	(0.14)	(0.35)
Time 2	0.411	–0.225	0.636***
	(1.61)	(1.17)	(3.69)
Time 1	0.405**	–0.048	0.452***
	(2.60)	(0.73)	(3.20)
Constant	6.640***	4.040***	2.600***
	(77.55)	(80.14)	(39.47)
R-squared	0.244	0.078	0.297

Notes: The number of observations is 300 and the number of firms is 100. Numbers in parentheses are *t*-statistics. *Significant at 10% level, **at 5% level, and ***at 1% level.

Table 6.7 Fixed-effects model estimates of the heterogeneous impacts of the training programs on management practice scores in a metalworking cluster in Addis Ababa

	Overall score (1)	***Kaizen* score (2)**	**Non-*Kaizen* score (3)**
A. Training × Education			
Time 2 × Group TT × Years of schooling	–0.030 (0.31)	0.001 (0.02)	–0.031 (0.41)
Time 1 × Group TC × Years of schooling	–0.016 (0.15)	–0.103 (1.18)	0.086 (1.27)
Time 2 × Group CT × Years of schooling	0.192* (1.92)	–0.003 (0.04)	0.195* (1.96)
R-squared	0.416	0.140	0.485
B. Training × Experience			
Time 2 × Group TT × Years of operation	0.001 (0.02)	–0.000 (0.01)	0.001 (0.03)
Time 1 × Group TC × Years of operation	0.070* (1.87)	0.008 (0.44)	0.062* (1.89)
Time 2 × Group CT × Years of operation	0.040 (1.01)	–0.016 (0.70)	0.056* (1.72)
R-squared	0.434	0.132	0.514
C. Training × Past management training			
Time 2 × Group TT × Other management training participation in the past	2.546*** (2.66)	0.177 (0.33)	2.369** (2.31)
Time 1 × Group TC × Other management training participation in the past	0.426 (0.35)	–0.120 (0.14)	0.546 (0.76)
Time 2 × Group CT × Other management training participation in the past	3.325** (2.31)	1.212* (1.68)	2.113** (2.51)
R-squared	0.460	0.141	0.521

Notes: The number of observations is 300 and the number of firms is 100.
Numbers in parentheses are *t*-statistics. *Significant at 10% level, **at 5% level, and ***at 1% level. Although not shown in the table, each regression includes two time dummies (i.e., Time 1, Time 2), three interaction terms (i.e., Time 2 × Group TT, Time 1 × Group TC, Time 2 × Group CT), the negative shock dummy, and a constant term, which appear in Table 6.6 as the explanatory variables.

the assumption that the effect will remain unchanged between before and after the on-site training program. The results shown in Table 6.4 suggest that this assumption is not valid as they indicate that while the effect of the classroom training was estimated to be positive and significant before the on-site training program, it became insignificant after the on-site training program. A possible interpretation of the coefficients on Time 1 × Group TC is the average of the effects before and after the on-site training. The coefficients on Time 2 × Group CT indicate the effects of the on-site training alone, which are estimated to be positive and marginally significant on the *Kaizen* and non-*Kaizen* scores.

Thus, the table offers evidence for the positive impacts of the on-site training program on the management practice scores. In column (3), the coefficients on Time 2 and Time 1 are positive, significant, and similar in magnitude. These results suggest that there were knowledge spillovers about non-*Kaizen* practices from both the classroom and on-site training program participants to the other sample entrepreneurs. As to *Kaizen* practices, there is no evidence found in this table for knowledge spillovers.

The same set of results is obtained in Table 6.6, where we change the definitions of the *Kaizen* and non-*Kaizen* scores. Among the practices listed in Table 6.1, some can be directly observed by our survey enumerators when they visited enterprises, but others cannot. For example, enumerators can easily verify whether or not the enterprise keeps defective items separately from other items. By contrast, they cannot determine whether the enterprise cleans the floor regularly and has to rely on the entrepreneur's self-report. Take the seventh practice in the non-*Kaizen* section of Table 6.1 as another example. It is usually impossible to establish by visual inspection whether the entrepreneur knows who the target clientele is, but the enumerator can judge objectively the entrepreneur's recognition from the way in which the entrepreneur talks about major customers. In Table 6.6, we use the management practice scores that count only such verifiable practices as the dependent variables, but the results are qualitatively the same as the results shown in Table 6.5.

We have so far assumed that the effect of a training program on the management practice scores of the training participants does not vary. There is a good reason for suspecting the validity of this assumption. For example, some existing studies of management practices report that more highly educated entrepreneurs are more likely to keep records of transactions and inventories (e.g., Drexler et al., 2014; McKenzie and Woodruff, 2012, Chapter 4), and our results suggest that those

entrepreneurs who had participated in management training programs in the past tend to absorb new knowledge well from our training programs (see Table 6.4). Table 6.7 shows the estimated fixed-effects models that explain the management practice scores while allowing the effects of the training programs to be heterogeneous among entrepreneurs.

Panel A of Table 6.7 reports the estimate of how an increase in the years of schooling of the entrepreneur increases the combined effects of the two training programs, the effect of the classroom training, and the effect of the on-site training on the overall score, the *Kaizen* score, and the non-*Kaizen* score. The table does not report the coefficient on the other interaction terms (i.e., Time 2 × Group TT, Time 1 × Group TC, and Time 2 × Group CT) and time dummies (i.e., Time 2 and Time 1), although the regression equation estimates include them. The coefficient on Time 2 × Group CT × Years of schooling has a positive and significant coefficient, indicating that an increase in the educational level strengthens the effect of the on-site training on the non-*Kaizen* score as we have expected. The significance level is not so high, however, and the estimated effect of an increase in the educational level on the combined effect of the two training programs is insignificant. Panel B finds that the training effects increase with the years of operation even though the combined effect of the two training programs does not increase with it.

The regression specification in Panel C of Table 6.7 allows the training effect to vary between those who participated in some other management training programs in the past and those who did not. As column (3) shows, the effect of the on-site training program and the combined effect of the two training programs on the non-*Kaizen* score vary between the two sub-groups within the treatment group, and the differences are significant at the 5 percent level. Similarly, there is a marginally significant difference in the effect of the on-site training on the *Kaizen*. These results are consistent with our interpretation of the results shown in Table 6.4 concerning the coefficient on the participation in other training programs in the past.

The ITT effects of the training programs on the business performance are presented in Table 6.8. The business performance is measured here by sales revenue and value added. Our definition of value added is sales revenue minus the sum of material cost, fuel and electricity cost, subcontracting cost, and labor cost. At the baseline surveys, we collected recall data of these sales and cost data for 2007, 2008, and 2009. These accounting-based indicators of business performance fluctuate wildly and admittedly subject to measurement errors, as de Mel et al. (2008) emphasize. Thus, it may not be statistically efficient to compare the

Table 6.8 Estimated impacts of the training programs on business performance in a metalworking cluster in Addis Ababa

	ln(sales revenue)		ln(value added)	
	Fixed effect	**McKenzie**	**Fixed effect**	**McKenzie**
	(1)	**(2)**	**(3)**	**(4)**
Time 2 × Group TT	–0.029	0.276	–0.138	–0.021
	(0.16)	(1.00)	(0.55)	(0.06)
Time 1 × Group TC	–0.016	–0.268	–0.094	–0.315
	(0.14)	(1.20)	(0.58)	(1.09)
Time 2 × Group CT	0.171	0.342	0.112	0.343
	(0.70)	(1.08)	(0.41)	(0.86)
Negative shock	–0.629**	–1.334***	–0.721**	–1.347**
	(2.39)	(3.42)	(2.07)	(2.52)
Time 2	–0.038	–0.282*	0.153	–0.115
	(0.41)	(1.92)	(1.00)	(0.60)
Time 1	0.120*		0.187	
	(1.90)		(1.65)	
Number of participants that the respondent knew		0.008		0.035**
		(0.47)		(2.23)
Years of operation		–0.001		0.009
		(0.07)		(1.08)
Years of schooling		0.058*		0.120**
		(1.79)		(2.44)
Parent's business experience		–0.325		–0.572*
		(1.51)		(1.96)
Non-Ethiopian		0.533		0.830
		(1.38)		(1.31)
Visited foreign countries		–0.246		–0.038
		(0.96)		(0.13)
Other management training participation		0.481*		0.318
		(1.83)		(1.30)
Average of pre-training dependent variable		0.802***		0.509***
		(19.93)		(4.29)
Constant	11.010***	1.415***	9.845***	2.987***
	(304.33)	(3.05)	(170.29)	(3.56)
Observations	291	194	288	192
Number of enterprises	97	97	96	96
R-squared	0.078	0.849	0.045	0.682

Notes: Numbers in parentheses are *t*-statistics. *Significant at 10% level, **at 5% level, and ***at 1% level.

follow-up outcomes with the outcome at a single baseline survey. Following the lead of McKenzie (2012), we use the average of business performance indicators in the three years before the experiment to correct baseline imbalances.

While columns (1) and (3) present the results of the fixed-effects model estimation that uses each data point separately, columns (2) and (4) use the average value of the performance indicator before the experiment. Moreover, columns (2) and (4) use the time-invariant characteristics of the entrepreneur as explanatory variables, which cannot be included in the fixed-effects model. Among such explanatory variables is the number of the participants that the entrepreneur knew already at the baseline survey, which is intended to capture the effect of knowledge spillovers on business performance.

Table 6.8 provides no direct evidence for ITT effects on business performance. The coefficients on the interaction terms of the time dummy and treatment status dummy variables are not just statistically insignificant but also small in magnitude and even negative in some cases. These results may be surprising because we saw the training programs, especially the on-site training program, have positive ITT effects on management practices as shown in Tables 6.5 to 6.7. Moreover, business performance is associated with the management practice scores prior to the training programs as shown in Table 6.3.

Such results, however, are not special to our experiment but common to other randomized controlled trials (RCTs) of management training for small enterprises conducted in developing countries (e.g., Bruhn et al., 2010; Karlan and Valdivia, 2011). There are several possible reasons. Bruhn et al. (2010) mention the "noise" in the business performance data and small sample size. These reasons are also possibly valid and even plausible in our case in which record-keeping practices are not yet common among the entrepreneurs and the market conditions are rapidly changing. Among the wild changes in market conditions, particularly annoying for metalworking businesses, and for studies about them, is that their access to foreign currency needed to purchase imported materials, especially metal sheets, is unfavorable and random. Even if they improve management practices drastically, if appropriate materials are unavailable, it is practically impossible for them to increase sales revenues and value added. The availability of foreign currencies improves and worsens at different times to different extents depending on enterprises, which would attenuate sizably the estimated ITT effect on business performance. There is no wonder that training effects on these performance indicators are estimated to be nil.

An important finding in Table 6.8 is that the positive and significant coefficient on the number of participants that the respondent knew in column (4) suggests that there were knowledge spillovers between participants and from participants to non-participants. To be sure, the impact of knowledge spillovers is not consistently estimated here. It is likely to be overestimated to the extent that more capable entrepreneurs tend to have a greater circle of acquaintances in the same trade. However, if the number of participants that the respondent knew is replaced by the number of sample entrepreneurs that the respondent knew, its coefficient is no longer significant, even though the result is not shown in this table. This increases the plausibility of the claim that there is a spillover effect on business performance.

6.5 Conclusions

In Ethiopia, our training programs improved the management practices of the treated (i.e., invited) entrepreneurs more than those of the untreated ones, so that the ITT effects on management practices were estimated to be positive and significant. Although the ITT effect on business performance was estimated to be zero, this result seems to be attributable to measurement errors and wildly changing availability of foreign currency. We have also found that there are knowledge spillover effects not only on management practices but also on business performance.

As mentioned earlier, the Ethiopian government is pursuing the national movement of modernization and sets the dissemination of *Kaizen* as an integral part of the movement. The preliminary results of this study have been discussed in seminars and conferences, through which we believe they have had some impacts on the *Kaizen* dissemination policy of the government. In this country, RCTs of management training prove more difficult to provide insight into the impact of training because even untreated entrepreneurs are exposed to the knowledge of *Kaizen* through word-of-mouth and the media, including an FM radio program that the Ethiopia *Kaizen* Institute (EKI), a government body for *Kaizen* dissemination, airs in various areas of the country. Instead this country with increasingly favorable access to *Kaizen* management knowledge seems to be able to provide researchers with opportunities to study the factors for and hindrances to the absorption and diffusion of management knowledge.

7

Increasing Interests in Management Training in a Knitwear Village in Hatay, Vietnam[1]

7.1 Introduction

In Vietnam, we have selected a knitwear cluster in Hatay province, which is near Hanoi but still surrounded by rural landscape. As in our sites in Addis Ababa (Chapter 6) and Dar es Salaam (Chapter 8), we conducted a classroom training program, in which trainees study in a classroom, and an onsite training programs, in which instructors visit trainees' workshops, as well as baseline and follow-up surveys in this rural town.

This chapter has two purposes. The first is to examine the extent to which the value of learning about management practices is unknown to business people in Vietnam. We are particularly curious whether there are any significant differences in management knowledge of entrepreneurs in East Asia represented by Vietnam and SSA represented by Ghana, Ethiopia, Kenya, and Tanzania. We collected data from the managers of small and medium enterprises (SMEs) producing knitwear in a suburb of Hanoi, the capital of Vietnam, before and after basic business training was provided for more than 100 managers in our sample. We designed the training programs together with local and international business consultants, who also served as instructors and who conducted the baseline and follow-up surveys.

The second purpose of our study is to examine which type of training is more effective. While the results of several business training experiments have been reported in the recent literature, most of them assess the impacts of only one type of training (McKenzie and Woodruff, 2012). However, in the world of development assistance practice, various types of training are also commonly conducted, such as hands-on consultation, peer-group discussion, and plant visits. Moreover, there can be a variety of ways in which the same subject is taught and a

variety of combinations of different subjects in a training program. The preceding studies have paid little attention to the issues of what should be taught and how, with a major exception of Drexler et al. (2014). Our study attempts to take a further step in this direction of research on the role that management training can play in industrial development assistance.

Our study site is a cluster of small and medium-sized knitwear enterprises previously studied by Vu et al. (2010). Most studies of management training look at the impacts of a training program on microfinance clients who operate in various business sectors. One concern for targeting the microfinance users is that the take-up rate may have been artificially biased upward as the participation into training is obligatory or recommended. Another concern is that the microfinance users tend to be very small in size, typically employing only a few workers (McKenzie and Woodruff, 2012), while in reality, many MSEs in developing countries are of larger sizes, sometimes employing dozens of workers. Our sample enterprises are much larger in terms of employment than those of other studies are, and this setting may offer a more realistic view of the potential of MSEs in developing countries.

Our contributions are as follows. Firstly, we found that the demand by entrepreneurs for these training programs was indeed low before the offer of training, possibly being a barrier to improve management, but it increased greatly as shown by the participation experience on relevant training programs. This suggests that these entrepreneurs' ex ante demand was low because they had not known the significance of attending these training sessions. Participation in one kind of training also increased the demand for another more advanced type of training to be offered in the future. Secondly, we confirmed that managerial capital is indeed transferrable via technical interventions, as shown in other existing studies and previous chapters. The training program had impacts on improving business practices as well as the business performance of participating enterprises. The on-site hands-on training customized to each workshop (hereinafter called on-site training) had a greater effect in improving business practices than the classroom lecture-type of training (hereinafter called classroom training), and there was also a synergistic effect from participating in both types of trainings. Thirdly, the higher quantiles in the business practice score distribution were found to benefit more from the training. Lastly, we found that the willingness to learn prior to training has positive effects in enhancing the training impact on the business practice, particularly when it is combined with their own learning through classroom training participation.

In Section 7.2, we illustrate our experimental setting and the data collected by our surveys. Section 7.3 presents the estimation method, and Section 7.4 explains the estimation results. The conclusion follows in Section 7.5.

7.2 Experimental setting and data

We implemented two types of training for the managers of SMEs in the knitwear industrial cluster in La Phu commune in Northern Vietnam, where many village-based industrial clusters are found (e.g., Vu et al., 2009, 2010). This cluster is located about 20 km from Hanoi, the capital of Vietnam. It has a long history of garment production, dating back before 1945 (Vu et al., 2010). In the past, many villagers from this cluster worked in French garment factories in Hanoi. In the 1960s, two state-owned enterprises (SOEs) were established near the village, producing towels and socks for export to the Soviet Union. In the 1970s, two cooperatives were established within the village, receiving subcontracting orders from these SOEs. When the Soviet Union collapsed in 1991, the SOEs stopped contracting out to these cooperatives, bringing closure to these cooperatives. The knitting machines used in the cooperatives were given to the member households, and this led to the expansion of household enterprises in this village. While these household enterprises sold their products to domestic market through petty traders in the beginning, many of them started exporting to Russia and Eastern Europe through the *Vietkieu*, overseas Vietnamese traders, who are originally from this village.

As of 2010, there were 161 enterprises that produce finished products, and most of them were engaged in knitwear clothing, such as sweaters, pants, and gloves.[2] Within this village and nearby villages, there are numerous household enterprises specializing in fabricating and knitting parts of clothes, such as sleeves or collars, which sell parts to these enterprises producing final products, comprising a large knitting-industry cluster. The majority of the entrepreneurs of the finished-product companies used to be employed by the cooperatives or the SOEs and have the experience of working as household subcontractors before they established their companies (Vu et al., 2010). According to our data, about 22.5 percent of the enterprises export, while the others target the domestic market. Contracting-out and subcontracting-in some parts of the work are very common within the cluster. In 2011, 97.5 percent of the enterprises in La Phu contracted-out their work, while 27.5 percent subcontracted-in their work, because the majority of the subcontractors are located in the neighboring villages.

In the summer of 2010, we started a series of interventions to the enterprises in the cluster. Figure 7.1 describes the timeline of our activities. We conducted interviews with all of the 161 managers of the finished-product enterprises based on a questionnaire. Out of the 161, two enterprises were dropped from the sample because they were selected as "model enterprises" in the on-site training and received exceptionally intensive treatment by the team of consultants. The managers of the remaining 159 enterprises were interviewed during the baseline survey conducted before the classroom training, the first follow-up survey between the two training programs, and the second follow-up survey after the on-site training. All but one in the baseline survey sample answered our questionnaires in both the first and second follow-up surveys, and the reason for this one enterprise's attrition was business closure. The survey included questions on the socio-economic characteristics of the manager and enterprise, business practices, workers hired, finance, business performance, and the owners' willingness to pay (WTP) to participate in the training programs.

Data on WTP for the classroom and on-site training programs were collected by using the dichotomous question separately for each program: "Would you pay 3 million VND (about USD155 as of 2010) to participate in the training program?"[3] This is a hypothetical question, which is unaccompanied by any actual payment for a training fee and does not penalize respondents who give an affirmative answer without careful consideration.[4] Thus, this question can lead to an exaggeration of the demand for training participation. In order to find a way to avoid such a bias in replies to hypothetical questions in general, Blumenschein et al. (2008) conducted laboratory experiments and found that the bias can be reduced to a negligible magnitude by means of what they call the "certainty approach." We employed this approach, which is the same in our context as asking, if the answer to the above WTP question was positive, an additional question, "How sure are you about the answer?" with dichotomous options, "definitely sure," or "probably sure," and

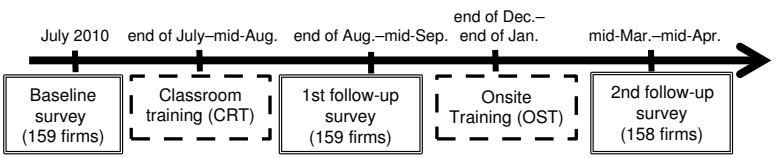

Figure 7.1 Schedule for the training programs and the surveys in the knitwear cluster near Hanoi

Note: The reason for attrition in the second follow-up survey is the closure of one firm.

only count "definitely sure" as the affirmative answer. Although it would be desirable to obtain information on the shape of the demand curve, it is unknown whether the certainty approach can be used in sequence to elicit the willingness of the same respondent to pay different prices, without affecting the respondent's valuation. We confined ourselves to only one level of training fee.[5]

Another unique feature of our survey is the set of very detailed business practice questions related to business records, quality improvement, marketing strategy, and *Kaizen* housekeeping practices, which will be explained below. Whenever possible, our enumerators tried to verify the respondent's answers by inspecting the housekeeping arrangements in the workshop carefully and asking additional questions. This worked well in the case of such questions as "Do you keep raw materials and scraps separately?" It did not work if, for example, the respondent did not keep any records and when the question was, "Do you separate household and business expenses?" Using the results of these structured interviews and observations, we constructed a business score index, which will be used to measure the performance of the enterprises. While we do not claim that this index is a perfect proxy of the quality of management, we believe it serves the purpose. Similar methods have been used in other studies (e.g., Bloom et al., 2013; de Mel et al., 2012).

After the baseline survey, we conducted the classroom lecture series, which lasted 3 weeks and was offered for 2.5 hours in the evening to accommodate as many participants as possible, essentially the same as in other study sites. The topics were (1) Entrepreneurship, Business Strategy, and Marketing, (2) Production Management (including *Kaizen*, explained later), and (3) Accounting and Costing. The training was offered in a local language in a participatory manner, and participants were able to engage in the active discussions following the lectures.

Our second intervention was the tailor-made on-site consulting services offered at the workshop of each enterprise. The main purpose of the on-site training was to facilitate a better understanding of basic production management by giving specific advice to managers at their actual work space. Prior to the on-site training, two enterprises were selected to act as model enterprises, and the team of consultants designed improvement plans for the model enterprises, including such changes as labeling the tools and materials and changing the layout of the workshop, and actually applying the plans to the model enterprises. At the beginning of the on-site training, a seminar was held to explain the overall goal of the on-site training to the participants, and photographs of these model workshops before and after the application of the plans

were also displayed. These model enterprises were also open to the participants afterward for observation. The criteria for the selection of the model enterprises were that the managers of the model enterprises must be willing to share knowledge and experience with other participants and willing to accept visitors to their workshops. Thus, the managers of the selected enterprises were more eager to learn about management and have larger workshops than average. The exclusion of these two enterprises from the sample would more likely lead to the underestimation of the impact of the training rather than overestimation. Each on-site training participant received visits from the consultant team twice. The first visit was to give advice based on the diagnosis of the current situation, and the second visit was to check on the progress and conduct follow-up.

Both the classroom and on-site training were conducted by a team of local consultants and a Japanese consultant. The local consultant leader is a certified business consultant who is a Master Trainer of the International Labour Organization's Start and Improve Your Business (SIYB) program, which has been implemented worldwide. The main purpose of including a Japanese consultant was to transfer the knowledge of *Kaizen* methods, a common-sense, inexpensive approach to management, which was developed on the basis of industrial engineering by incorporating the experiences and insights of Japanese manufacturing enterprises and is now commonly practiced in developed countries and emerging economies. The dispatched consultants were experts on *Kaizen* and had considerable experience in *Kaizen* training in Southeast Asia as well as in Japan. The local consultants were also able to learn from them for future use.

To conduct the experimental training, among the total 158 sample enterprises, we randomly selected 89 enterprises to invite to the classroom training program and 48 enterprises to invite to the on-site training programs, as shown in Table 7.1. We refer to invitation as treatment in this table, so that the treatment group of the classroom training program consists of enterprises invited to this program, while the enterprises not invited to this program constitute the control group. There were 32 enterprises invited to both programs (Group 1) and 53 enterprises invited to neither program (Group 4). We deliberately invited more than half of the sample enterprises to the classroom training program taking account of the possibility of refusal to attend the training. Indeed 37 invited enterprises did not participate in the classroom training. By contrast, all the enterprises invited to the on-site training program participated in that program.

Table 7.1 Sample size by treatment status in the knitwear cluster near Hanoi

		Classroom training		Total
		Treatment group	**Control group**	
On-site Training	Treatment group	Group 1 32	Group 3 16	On-site treatment 48 (Refused: 0)
	Control group	Group 2 57	Group 4 53	On-site control 110
Total		Classroom treatment 89 (Refused: 37)	Classroom control 69	158

Source: Own surveys.

Table 7.2 presents the characteristics and business performances of each group observed during the baseline survey. The first two columns compare the treatment and control groups of the classroom training, and the *p*-values in column (3) indicate the statistical significance of the difference between the two groups. Columns (4) to (6) compare Group 1 and Group 2, while columns (7) to (9) compare Group 3 and Group 4. From these figures, we can see that the owners tend to be around 40 years old, and about 60 percent of the owners are females, reflecting the fact that this is the fashion industry. Owners tend to have seven to eight years of education and have operated for about ten years. On average, they hired about 14.3 workers (permanent-worker equivalent) at the time of the baseline survey.[6] This is worth emphasizing because most other studies of management training experiments focus on self-employed business persons or micro enterprises with much smaller employment sizes.

Another important point is that despite the randomization, there are some statistically significant differences among the groups. This is because the sample size is small and because we divided the small sample into four groups, not just two. For example, while the treatment and control groups of the classroom training program do not differ significantly in the WTP, significant differences emerge if we divide the sample into four groups. We will pay due consideration to this point when we assess the impacts of the training programs in the next two sections.

Table 7.2 Mean characteristics prior to the intervention by treatment status in the knitwear cluster near Hanoi

	Groups 1 & 2	Groups 3 & 4		Group 1	Group 2		Group 3	Group 4	
	Invited to classroom training	Uninvited to classroom training	*p*-value for H_0: (1)=(2)	Invited to both programs	Invited only to classroom training	*p*-value for H_0: (4)=(5)	Invited only to on-site training	Invited to neither program	*p*-value for H_0: (7)=(8)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Owner's age	40.9	40.8	[0.93]	40.4	41.2	[0.68]	39.3	41.4	[0.49]
	(8.92)	(10.64)		(7.91)	(9.50)		(8.56)	(11.2	
Male owner (%)	36.0	37.1	[0.88]	25.0	42.1	[0.11]	43.8	34.0	[0.48]
	(48.26)	(48.67)		(43.99)	(49.81)		(51.23)	(47.81)	
Owner's education (years)	7.9	8.5	[0.18]	7.8	8.0	[0.70]	8.6	8.5	[0.89]
	(2.66)	(3.23)		(2.27)	(2.88)		(3.40)	(3.24)	
Years of operation	10.2	9.5	[0.39]	10.7	9.9	[0.47]	9.8	9.5	[0.84]
	(4.60)	(4.81)		(4.80)	(4.51)		(4.15)	(5.01)	
Training experience (%)	13.5	10.3	[0.55]	12.5	14.0	[0.84]	25.0	5.9	[0.03]
	(34.35)	(30.61)		(33.6)	(35.0)		(44.7)	(23.76)	
Relatives abroad (#)	0.1	0.3	[0.12]	0.1	0.1	[0.54]	0.1	0.3	[0.50]
	(0.53)	(0.91)		(0.71)	(0.40)		(0.50)	(1.01)	
Relatives in the sample (#)	1.3	0.8	[0.12]	2.1	0.8	[0.00]	0.5	0.92	[0.36]
	(1.87)	(1.61)		(2.03)	(1.63)		(0.82)	(1.79)	

Permanent workers (#)	9.2	19.0	[0.03]	8.5	9.6	[0.60]	26	17.2	[0.45]
	(10.01)	(39.70)		(4.92)	(11.99)		(44.14)	(38.82)	
Seasonal workers (#)	4.1	5.8	[0.21]	5.2	3.5	[0.24]	8.1	5.2	[0.31]
	(6.50)	(9.86)		(9.02)	(4.51)		(13.06)	(8.78)	
Revenue (2009, USD)	194,397	283,683	[0.08]	239,808	168,903	[0.10]	346,680	267,874	[0.51]
	(194,996)	(415,166)		(203,467)	(187,067)		(449,209)	(410,232)	
Value added (2009, USD)	59,367	81,400	[0.30]	67,756	54,657	[0.53]	90,504	79,619	[0.83]
	(93,910)	(169,585)		(93,626)	(94,569)		(165,583)	(173,773)	
Willingness to pay (WTP) for:									
Classroom training (%)	20.2	14.3	[0.33]	28.1	15.8	[0.17]	37.5	7.5	[0.00]
	(40.4)	(35.2)		(45.7))	(36.8)		(50.0)	(26.7)	
On-site training (%)	5.6	8.6	[0.47]	15.6	0	[0.00]	25.0	3.8	[0.01]
	(23.2)	(28.2)		(36.9)	(0)		(44.7)	(19.2)	

Note: Standard deviations are reported in parentheses.

Source: Own surveys.

7.3 Estimation methods

We focused on the estimation of the intention-to-treat (ITT) effects and the treatment effect on the treated (TOT). The ITT estimates will show whether being invited to the training programs will enhance the outcomes, that is, WTP, business practice score, and business performance, of those invited enterprises, while the TOT estimates will show the extent to which participating in the training programs will enhance the outcomes of the participants. The estimate of the ITT can be obtained by running the following regression:

$$y_i = \alpha_1 I_i^B + \alpha_2 I_i^C + \alpha_3 I_i^O + X_i\varphi + \varepsilon_i, \quad (1)$$

where y_i is the outcome variable (i.e., either WTP, business practice scores, or business performance) for enterprise i after the on-site training program, I_i^j is the invitation status dummy which is equal to 1 if enterprise i was invited to the training program j (= both, classroom, on-site) and 0 otherwise, and X_i is a vector of variables representing the socio-economic characteristics of the business owner, which happened to be time-invariant in our sample, α's are coefficients and φ is a vector of coefficients, and ε_i is an error term. If enterprise i was invited to the classroom training program only, then $I_i^C = 1$ and $I_i^C = I_i^B = 0$. Likewise, if enterprise i was invited to the on-site training program only, then $I_i^O = 1$ and $I_i^C = I_i^B = 0$. If enterprise i was invited to both programs, the three invitation status dummies are equal to 1. Thus, I_i^B is the product of I_i^C and I_i^O, and the impact of being invited to both programs is equal to $\alpha_1 + \alpha_2 + \alpha_3$.

The fixed-effect model corresponding to equation (1) may be written,

$$y_{it} = \beta_1 I_i^B T_t^O + \beta_2 I_i^C T_t^O + \beta_3 I_i^O T_t^O + u_i + \lambda_t + w_{it}, \quad (2)$$

where y_{it} is the outcome of enterprise i at time t, which is before the classroom training program (i.e., at the time of the baseline survey) or after the on-site training program (i.e., at the time of the second follow-up survey), T_t^O is a time dummy that equals 1 if t is the time after the on-site training program (i.e., the time of the second follow-up survey) and 0 if t is before the on-site training program (i.e., the time of the baseline survey), λ_t is the time effect common to all the enterprises, u_i is the fixed effect of enterprise i, and w_{it} is an error term. The effects of the time-invariant characteristics X_i in equation (1) are superseded by the fixed effect u_i in equation (2).

Coefficients β's in equation (2) capture the changes in the treatment group's outcome from the time of the baseline survey to the time of the second follow-up survey relative to the control group's counterpart. Coefficients α's in equation (1) capture the difference in the level

between the groups at the time of the second follow-up survey, which amounts to the difference in the initial level plus the difference in the changes. If randomization were perfect, there would be no difference in the initial level and, hence, the estimates of α's would be close to the estimates of β's, even though the estimation of equation (1) uses only the second follow-up survey data while the estimation of equation (2) uses both the baseline data and the second follow-up survey data. As we have seen from Table 7.2, however, it happened to be that at the time of the baseline survey, those enterprises which were invited only to the on-site training program (i.e., Group 3) were already more willing to pay for the classroom training than those who were invited to neither program (i.e., Group 4). Thus, the estimate of α_3 is expected to be greater than the estimate of β_3 in the regressions of the WTP for the classroom training.

Another version of the fixed-effects model may be written as

$$y_{it} = \gamma_1 I_i^B T_t^C + \gamma_2 I_i^B T_t^O + \gamma_3 I_i^C T_t^C + \gamma_4 I_i^C T_t^O + \gamma_5 I_i^O T_t^C + \gamma_6 I_i^O T_t^O + u_i + \lambda_t + \varepsilon_{it}, \quad (3)$$

where subscript t indicates the time of either the baseline survey, the first follow-up survey, or the second follow-up survey, T_t^C is a time dummy equal to 1 if t is the time after the classroom training program (i.e., the time of the first or the second follow-up survey). The estimation of this fixed-effects model is expected to reveal the timing of when each group felt the impacts of the interventions. For example, suppose that Group 2 increases their WTP for the classroom training after the classroom training program relative to the control group and further increases it after the on-site training program. In this case, both γ_3 and γ_4 will be positive, and the combined effect $\gamma_3 + \gamma_4$ should be equal to the training effect on the WTP measured after the on-site training, that is, β_2 in equation (2). Likewise, $\gamma_1 + \gamma_2$ should be equal to β_1, and $\gamma_5 + \gamma_6$ should be equal to β_3.[7]

We now turn to our method for estimating the TOT. The equations to be estimated are similar to equations (1) to (3), but they feature the participation status dummies *P*'s instead of the invitation status dummies *I*'s. As we saw in Table 7.1, a number of the enterprises that were invited to the classroom training program did not participate in it. Hence, P_i^C is not equal to I_i^C, and it is not exogenous like I_i^C but self-selected. Likewise, the interaction terms $P_i^C T_t^C$ and $P_i^C T_t^O$, the counterparts of $I_i^C T_t^C$ and $I_i^C T_t^O$ in equation (2) or (3), are endogenous. By contrast, P_i^O is equal to I_i^O for all i because in the case of the on-site training, every sample enterprise complied with the random assignment to the treatment or control group. It should be clear, however, that P_i^B, the dummy indicating whether enterprise i participated in both programs, is endogenous, and so are the interaction terms that include P_i^B. To mitigate the estimation-bias problem arising from the self-selection into participation in the classroom training

program, we apply the instrumental variable method to the endogeneity of P_i^C, P_i^B, and the interaction terms of these dummies and time dummies. Our instrumental variables are I_i^C, I_i^B, and the corresponding interaction terms, which should be valid instrumental variables because they are closely associated with the corresponding endogenous variables but exogenous to the outcomes.

We used equations (1) to (3) and their instrumental variable (IV) counterparts to estimate the ITT and TOT on the WTP, the business practice score, and business performance. In addition, we estimated the quantile treatment effect (QTE) on the business practice score, that is, the impacts of the training on the distribution of the business practice score, not just its means. Examining the difference of training impact across the distribution may provide additional information useful for designing a more effective training program. Suppose, for example, that the training increases the business practice scores of only those participants whose baseline scores were relatively high. It is advisable to revise the training contents so that they can be understood and adopted by a greater number of participants. Conversely, if the training is found to benefit only the participants with relatively low initial scores, it suggests the need for providing a more advanced course for those with relatively high initial scores.

We estimated the QTEs of the classroom and on-site training programs. For the classroom training program, we employed the unconditional endogenous quantile regression estimator developed by Frölich and Melly (2010). For the on-site training program, however, we employed the unconditional exogenous quantile regression estimator developed by Firpo (2007) because all the invited enterprises participated in the on-site training but not in the classroom training. Frölich and Melly (2010) show that unlike the mean treatment effect, estimated QTEs are asymptotically affected by the inclusion of covariates even when the covariates are independent from the treatment status. In their method, the covariates are excluded from the final regression equation but included in the first-stage regression.[8]

Before closing this section, we would like to add that there may be spillovers of training effects from the participants to the non-participants because of the strong social interactions in the cluster. As such, the estimated training effects might be expected to be biased downward.

7.4 Estimation results

Since the take-up rate for the invitation to classroom training was low (Table 7.1), we began by examining who actually participated in the classroom training. The estimates of the probit models are shown in Table 7.3.

Table 7.3 Determinants of classroom training participation in the knitwear cluster near Hanoi (probit, ME)

	=1 if participated in classroom training	
	(1)	**(2)**
Age	–0.018**	–0.015**
	(2.46)	(2.22)
=1 if male	0.253*	0.217*
	(1.92)	(1.73)
Years of education	–0.030	–0.011
	(1.12)	(0.46)
Years of operation	0.002	0.003
	(0.14)	(0.20)
=1 if born in the village	–0.223	–0.070
	(0.66)	(0.18)
=1 if with training experience	–0.089	–0.022
	(0.49)	(0.12)
No. of relatives abroad	–0.134	–0.091
	(1.17)	(0.88)
No. of relatives in this sample	–0.014	–0.025
	(0.23)	(0.42)
No. of relatives who attended classroom training	0.123	0.126
	(1.44)	(1.45)
Total score in the baseline	0.079**	
	(2.16)	
Observations	88	89
Pseudo-R^2	0.15	0.11

Notes: Numbers in parentheses are *z*-statistics. *Significant at 10% level, **at 5% level, and ***at 1% level. ME, marginal effect.

Three explanatory variables (i.e., the age, sex, and initial business practice score of the business owner) are statistically significant, indicating that among the invited entrepreneurs, those who accepted the invitation tended to be young males and have relatively high initial business practice scores. As shown in Table 7.1, the take-up rate for on-site training improved dramatically to 100 percent compared with the take-up rate for classroom training. This increase might have occurred because of the lower opportunity costs or higher perceived benefit of the on-site training relative to the classroom training, or because they came to value managerial training in general more than before the classroom training program.

Tables 7.4 and 7.5 present the estimated ITT and TOT, respectively, of the classroom and on-site training programs on the WTP for each training program. Columns (1) to (3) show the estimated impacts on the

Table 7.4 ITT impacts of training on willingness to pay (WTP) in the knitwear cluster near Hanoi

	WTP for classroom training			WTP for on-site training		
	Cross section OLS	Panel FE	Panel FE	Cross section OLS	Panel FE	Panel FE
	(1)	(2)	(3)	(4)	(5)	(6)
Both Invite	–0.019			0.384***		
	(0.12)			(2.72)		
Class Invite	0.259***			–0.023		
	(3.21)			(0.76)		
On-site Invite	0.334**			0.325***		
	(2.59)			(2.87)		
Both Invite × T_{class}			0.216**			0.012
			(2.01)			(0.34)
Both Invite × $T_{on\text{-}site}$		0.202	–0.014		0.401***	0.389***
		(1.64)	(0.19)		(3.22)	(3.15)
Class Invite × T_{class}			0.190***			0.019
			(3.06)			(1.00)
Class Invite × $T_{on\text{-}site}$		0.173***	–0.018		0.036	0.018
		(2.85)	(1.00)		(1.41)	(1.00)
On-site Invite × T_{class}			–0.038			0.019
			(1.42)			(1.00)
On-site Invite × $T_{on\text{-}site}$		0.025	0.062		0.144*	0.125
		(0.37)	(1.02)		(1.68)	(1.49)
T_{class}			0.038			–0.019
			(1.42)			(1.00)
$T_{on\text{-}site}$		0.038	0.000		–0.019	–0.000
		(1.43)	(0.01)		(1.00)	(0.01)

Age	–0.004			0.001		
	(1.03)			(0.27)		
=1 if male	0.054			0.025		
	(0.75)			(0.50)		
Years of education	0.001			0.014		
	(0.07)			(1.59)		
=1 if born in the village	0.225**			0.097		
	(2.10)			(1.22)		
Years of operation	–0.004			–0.011**		
	(0.49)			(2.07)		
No. of relatives abroad	–0.013			–0.059*		
	(0.22)			(1.75)		
=1 if with training experience	0.012			0.094		
	(0.10)			(1.41)		
No. of relatives in this sample	0.031			0.008		
	(1.29)			(0.71)		
Constant	0.050	0.177***	0.177***	–0.114	0.070***	0.070***
	(0.21)	(12.34)	(9.47)	(0.67)	(6.40)	(8.06)
Observations	156	316	474	156	316	474
Number of enterprises	156	158	158	156	158	158
R-squared	0.25	0.30	0.29	0.55	0.47	0.45
Probability > *F* (or chi^2)	0.00	0.00		0.00	0.00	

Notes: Robust *t*-statistics in parentheses (clustered SE at ID level for ITT). *Significant at 10% level, **at 5% level, and ***at 1% level. Variables with + are instrumented with random invitation status. FE, fixed effects.

Table 7.5 TOT impacts of training on WTP in the knitwear cluster near Hanoi

	WTP for classroom training			WTP for on-site training		
	Cross section	Panel	Panel	Cross section	Panel	Panel
	IV	FEIV	FEIV	IV	FEIV	FEIV
	(1)	(2)	(3)	(4)	(5)	(6)
Both Participate^{+}	–0.152			0.541***		
	(0.66)			(2.75)		
Class Participate^{+}	0.497***			–0.025		
	(3.93)			(0.48)		
On-site Participate	0.339***			0.340***		
	(2.70)			(3.06)		
Both Participate × T_{class}^{+}			0.229			0.010
			(1.50)			(0.17)
Both Participate × $T_{on\text{-}site}^{+}$		0.217	–0.012		0.567***	0.558***
		(1.41)	(0.11)		(3.57)	(3.44)
Class Participate × T_{class}^{+}			0.362***			0.036
			(3.58)			(1.14)
Class Participate × $T_{on\text{-}site}^{+}$		0.328***	–0.033		0.069*	0.033
		(3.41)	(0.89)		(1.66)	(1.13)
On-site Participate × T_{class}			–0.038			0.019
			(1.54)			(1.08)
On-site Participate × $T_{on\text{-}site}$		0.025	0.063		0.144	0.125
		(0.37)	(0.99)		(1.55)	(1.39)
T_{class}			0.038			–0.019
			(1.54)			(1.08)

$T_{\text{on-site}}$		0.038	0.000		–0.019	–0.000**
		(1.54)	(0.68)		(1.08)	(2.37)
Age	–0.001			0.002		
	(0.38)			(0.68)		
=1 if male	–0.002			–0.006		
	(0.04)			(0.12)		
Years of education	0.001			0.014*		
	(0.11)			(1.90)		
=1 if born in the village	0.245**			0.121*		
	(2.27)			(1.75)		
Years of operation	–0.005			–0.009**		
	(0.77)			(2.08)		
No. of relatives abroad	–0.010			–0.037*		
	(0.27)			(1.82)		
=1 if with training experience	0.025			0.048		
	(0.25)			(0.75)		
No. of relatives in this sample	0.024			0.003		
	(1.11)			(0.28)		
Constant	–0.058	0.177***	0.177***	–0.181	0.070***	0.070***
	(0.28)	(6.32)	(6.32)	(1.22)	(3.64)	(3.64)
Observations	156	316	474	156	316	474
Number of ID	156	158	158	156	158	158
R-squared	0.46			0.64		
Prob > *F* (or chi^2)	0.00	0.00	0.00	0.00	0.00	0.00

Notes: Robust *t*-statistics in parentheses (cluster bootstrapped SE at ID level for TOT). *Significant at 10% level, **at 5% level, and ***at 1% level. Variables with + are instrumented with random invitation status. FEIV, fixed-effects and instrumental variable method of estimation.

WTP for the classroom training, while columns (4) to (6) show those for the on-site training. Columns (1) and (4) report the OLS estimates of equation (1) discussed in the previous section, while columns (2) and (5) report the estimated fixed-effects model in equation (2) and columns (3) and (6) to the fixed-effects model in equation (3).

In column (1) of Table 7.4, the coefficient on the *Class Invite* dummy is positive and significant. This result is reinforced by the positive and significant coefficient on the interaction term *Class Invite* × $T_{\text{on-site}}$ in column (2) as well as those on the interaction terms *Both Invite* × T_{class} and *Class Invite* × T_{class} in column (3). These results are consistent with our expectation that the training program increases the WTP. Although the OLS estimate of the coefficient on *On-site Invite* dummy is positive and significant in column (1), its fixed-effect counterparts, that is, the coefficients on *On-site Invite* × $T_{\text{on-site}}$ in columns (2) and (3) are insignificant. These results indicate that while Group 3 is more willing to pay for the classroom training than Group 4, this is not a result of the training that Group 3 received. Presumably this is because Group 3 happened to include those business owners who were willing to pay for the classroom training from the beginning, as we saw in Table 7.2.

In column (4), the coefficients on the *Both Invite* and the *On-site Invite* dummies are positive and significant. Consistently, the coefficient on the interaction term *Both Invite* × $T_{\text{on-site}}$ is positive and significant in columns (5) and (6), and so is the coefficient on *On-site Invite* × $T_{\text{on-site}}$ in column (5). These results indicate that the WTP of Groups 1 and 3 for the on-site training increased after the on-site training program.

Table 7.5 reports the estimates of the TOT impacts of the two training programs on the WTP for each program. To mitigate the estimation bias due to the self-selection into participation, the explanatory variables are instrumented with the corresponding invitation status. The estimates shown in Table 7.5 are qualitatively similar to those in Table 7.4. Overall, the regression results shown in Tables 7.4 and 7.5 lend strong support to our hypotheses that small business owners are unaware of the value of learning about basic management practices, and that participation even in a short-term training course like ours can help them appreciate the value of improving managerial skills.

In order to assess the impact of training on the business practices, we listed 30 basic business practices, and during each survey, we counted how many of the 30 practices each sample enterprise had adopted by the time of the survey. Before examining the changes in these scores due to participation, we examined the association between the initial business practice score and the initial business performance in terms of the revenue, value added, and profit in 2009. The results are shown in Table 7.6. The

Table 7.6 Pre-program relation between the total scores and performance in the knitwear cluster near Hanoi

	ln(Revenue)	**ln(VA)**	**ln(Profit)**
	(1)	**(2)**	**(3)**
Total score	0.186***	0.159***	0.160***
	(4.64)	(3.18)	(3.16)
Age	–0.019	–0.006	–0.007
	(1.56)	(0.46)	(0.51)
=1 if male	0.009	–0.143	–0.209
	(0.05)	(0.57)	(0.82)
Years of education	–0.008	–0.015	0.007
	(0.22)	(0.30)	(0.15)
=1 if born in the village	–0.093	1.326	1.007
	(0.15)	(1.51)	(1.13)
No. of relatives relatives abroad	0.444***	0.609***	0.491***
	(3.27)	(4.14)	(3.33)
=1 if with training experience	0.376	0.551	0.269
	(1.42)	(1.49)	(0.69)
Years of operation	0.048**	0.027	0.044
	(2.26)	(0.95)	(1.60)
No. of relatives in this sample	0.124***	0.130**	0.066
	(2.95)	(2.16)	(1.03)
Constant	9.779***	7.258***	7.386***
	(10.80)	(5.59)	(5.52)
Observations	154	133	122
R-squared	0.30	0.22	0.21

Notes: Numbers in parentheses are *t*-statistics. *Significant at 10% level, **at 5% level, and ***at 1% level.

business score is positively associated with these indicators of business performance at the 1 percent level of statistical significance, even though this table is purely descriptive and not intended to show the causal relationship. This exercise is intended only to see if the impacts of the training programs on this business score are worth exploring.

Note, however, that the two rounds of follow-up survey were conducted very soon after the intervention for the post-training performance of the training participants to be reflected in their revenues, value added, or profits. Thus, we explored only the impacts of the training programs on the business score, as shown in the first three columns in Tables 7.7 and 7.8, and the impacts on the logarithm of material costs in the last two columns. Compared with sales revenues, value added, and profit, material costs may quickly reflect improvement in managerial skills or in business practices. We have to admit that such improvement

Table 7.7 ITT impacts of training on total scores and log of material costs in the knitwear cluster near Hanoi

	Total scores			Log of material costs	
	Cross section	Panel	Panel	Cross section	Panel
	OLS	FE	FE	OLS	FE
	(1)	(2)	(3)	(4)	(5)
Both Invite	0.429			0.056	
	(0.46)			(0.12)	
Class Invite	0.996**			0.205	
	(2.35)			(0.95)	
On-site Invite	5.024***			0.086	
	(7.68)			(0.23)	
Both Invite × T_{class}			1.137**		
			(2.50)		
Both Invite × $T_{on\text{-}site}^{\neq}$		1.472**	0.352		0.271
		(2.50)	(0.86)		(1.14)
Class Invite × T_{class}			1.287***		
			(5.24)		
Class Invite × $T_{on\text{-}site}^{\neq}$		1.309***	0.005		–0.012
		(4.42)	(0.04)		(0.07)
On-site Invite × T_{class}			–0.144		
			(1.32)		
On-site Invite × $T_{on\text{-}site}^{\neq}$		3.720***	3.847***		–0.388**
		(17.55)	(18.61)		(2.12)
T_{class}			0.144**		
			(2.30)		
$T_{on\text{-}site}$		0.280**	0.153		
		(2.45)	(1.48)		
Year 2009					0.017

					(0.28)
Year 2010					0.053
					(0.35)
Age	–0.004			–0.015	
	(0.16)			(1.41)	
=1 if male	1.244***			0.264	
	(3.01)			(1.48)	
Years of education	0.313***			0.083**	
	(3.96)			(2.44)	
=1 if born in the village	1.526*			–0.405	
	(1.94)			(1.49)	
Years of operation	0.025			0.039**	
	(0.65)			(2.04)	
No. of relatives abroad	0.171			0.396***	
	(0.53)			(3.83)	
=1 if with training experience	1.902***			0.420	
	(3.26)			(1.46)	
No. of relatives in this sample	–0.008			0.140***	
	(0.08)			(3.14)	
Constant	6.557***	11.186***	11.186***	10.636***	11.264***
	(4.21)	(153.26)	(134.89)	(17.08)	(278.87)
Observations	154	312	464	156	471
Number of ID	154	158	158	156	158
R-squared	0.62	0.79	0.76	0.24	0.01
Prob > *F* (or chi^2)	0.00	0.00	0.00	0.00	0.07

Notes: Robust *t*-statistics in parentheses (clustered SE at ID level for ITT). *Significant at 10% level, **at 5% level, and ***at 1% level. Variables with + are instrumented with random invitation status. The data used in this column are a panel of 2008, 2009, and 2010. Accordingly, $T_{\text{on-site}}$ in these interaction terms in this column should read a dummy variable, Year 2010, which indicates whether the year is 2010.

Table 7.8 TOT impacts of training on total scores and log of material costs in the knitwear cluster near Hanoi

	Total scores		Log of material costs		
	Cross section	Panel	Panel	Cross section	Panel
	IV	FEIV	FEIV	IV	FEIV
	(1)	(2)	(3)	(4)	(5)
Both Participate^{+}	0.105			–0.022	
	(0.08)			(0.03)	
Class Participate^{+}	1.940***			0.396	
	(2.79)			(0.98)	
On-site Participate	5.069***			0.094	
	(8.04)			(0.25)	
Both Participate × T_{class}^{+}			1.078***		
			(2.68)		
Both Participate × $T_{\text{on-site}}^{+\neq}$		1.601**	0.556		0.399
		(2.04)	(0.75)		(0.81)
Class Participate × T_{class}^{+}			2.421***		
			(7.86)		
Class Participate × $T_{\text{on-site}}^{+\neq}$		2.444***	–0.009		–0.023
		(6.55)	(0.04)		(0.06)
On-site Participate × T_{class}			–0.144		
			(1.20)		
On-site Participate × $T_{\text{on-site}}^{\neq}$		3.720***	3.847***		–0.388**
		(16.26)	(15.47)		(2.06)
T_{class}			0.144**		
			(2.22)		
$T_{\text{on-site}}$		0.280**	0.153		
		(2.28)	(1.33)		

Year 2009					0.017
					(0.30)
Year 2010					0.053
					(0.36)
Age	0.009			–0.013	
	(0.47)			(1.22)	
=1 if male	0.977**			0.213	
	(2.50)			(1.19)	
Years of education	0.314***			0.083**	
	(4.50)			(2.46)	
=1 if born in the village	1.638*			–0.384	
	(1.89)			(1.39)	
Years of operation	0.023			0.039*	
	(0.67)			(1.95)	
No. of relatives abroad	0.208			0.401***	
	(0.81)			(4.36)	
=1 if with training experience	1.891***			0.421	
	(3.38)			(1.46)	
No. of relatives in this sample	–0.039			0.134***	
	(0.43)			(2.72)	
Constant	6.040***	11.191***	11.189***	10.536***	11.264***
	(4.01)	(55.30)	(54.59)	(16.97)	(103.02)
Observations	154	312	464	471	156
Number of ID	154	158	158	158	156
R-squared	0.71				0.22
Prob > *F* (or chi^2)	0.00	0.00	0.00	0.06	0.00

Notes: Robust *t*-statistics in parentheses (clustered SE at ID level for ITT, cluster bootstrapped SE at ID level for TOT). *Significant at 10% level, **at 5% level, and ***at 1% level. Variables with + are instrumented with random invitation status. The data used in column (5) are a panel of 2008, 2009, and 2010. Accordingly, $T_{\text{on-site}}$ in these interaction terms in this column should read a dummy variable, Year 2010, which indicates whether the year is 2010.

can theoretically increase or decrease material costs. While better production management will reduce wasteful uses of materials, the improved efficiency may lead to the expansion of production, which may in turn require a greater input of materials in the long run. In view of the fact that the follow-up surveys were conducted soon after the training programs were completed, we expect that our data reflect primarily the cost reduction effect of improved management.

Tables 7.7 and 7.8 report the ITT and TOT impacts, respectively, of the training programs on the business score and material cost. The design of the first three columns in these tables is the same as that in Tables 7.4 and 7.5.[9] According to column (3) of Table 7.7, the invitation to the classroom training increased the business score by 1.29 points (out of 30 points) for Group 2 and by 1.29 + 1.14 points for Group 1, while the invitation to the on-site training program increased the score by 3.85 points for Group 3 and by 3.85 + 0.35 points for Group 1, compared with Group 4. The TOT counterparts of these impacts on the business scores are stronger for Groups 1 and 2, as shown in Table 7.8.

The results of the regressions of material costs are somewhat mixed. As shown in column (4) of Tables 7.7 and 7.8, the impacts of the two training programs on material costs are insignificant if they are estimated by means of the second follow-up survey only. As shown in column (5), however, the impact of the on-site training program is negative and significant, if it is estimated by means of the fixed-effects estimator or the fixed-effects IV estimator. The result that the impact of the on-site training was stronger than the impact of the classroom training is consistent with the fact that the on-site training was centered around *Kaizen*, which emphasizes the reduction of wasteful uses of materials, time, and other resources.

Apart from the business practice score, we also elicited directly from the participants whether they adopted any practices that they had learnt from the training program. Table 7.9 reports the estimated linear probability models explaining the presence or absence of such adoption of practices, using the sample of participants only. Columns (1) and (2) concern the adoption behaviors of the classroom training participants. While the WTP is included in column (1), it is not in column (2) to avoid the estimation bias due to the possible endogeneity of the WTP. Similarly, columns (3) and (4) are intended to examine the adoption behaviors of the on-site training participants, and their WTP is included in column (3) but not in column (4).

In columns (1) and (2), no coefficient is significant, indicating that no characteristics affect the adoption behavior of the participants in the

Table 7.9 Estimated linear probability model of application of knowledge after training in the knitwear cluster near Hanoi

	=1 if implemented something learnt after participating in:			
	Classroom training		**On-site training**	
	(1)	**(2)**	**(3)**	**(4)**
Age	–0.004	–0.003	–0.013	–0.013
	(1.07)	(1.03)	(1.41)	(1.37)
=1 if male	0.054	0.057	–0.056	–0.065
	(0.80)	(0.85)	(0.32)	(0.38)
Education	–0.029	–0.030	–0.067**	–0.065*
	(1.56)	(1.58)	(2.05)	(1.87)
Years of operation	–0.005	–0.004	–0.016	–0.019
	(0.35)	(0.34)	(0.96)	(1.10)
=1 if with training experience	–0.052	–0.051	0.089	0.059
	(0.32)	(0.32)	(0.35)	(0.23)
No. of relatives abroad	–0.033	–0.043	0.075	0.068
	(1.09)	(1.29)	(1.65)	(1.54)
Total score before classroom training	0.020	0.024		
	(1.36)	(1.57)		
WTP for classroom training before classroom training	0.061			
	(1.24)			
Total score before on-site training			0.024	0.033*
			(1.30)	(1.78)
WTP for on-site training before on-site training			0.194**	
			(2.14)	
Constant	1.124***	1.087***	1.743**	1.698**
	(3.93)	(4.09)	(2.28)	(2.12)
Observations	52	52	46	46
R-squared	0.12	0.11	0.20	0.16
Dependent variable mean	94.2%		85.4%	
Standard deviation	0.24		0.36	

Notes: Numbers in parentheses are *t*-statistics. *Significant at 10% level, **at 5% level, and ***at 1% level.

classroom training program. By contrast, among the on-site training participants, the adoption of any practices that were taught during the on-site training program is associated negatively with their education levels and positively with their initial WTP, and to a lesser extent with their initial business scores. Thus, the practices taught in the on-site training program may not be new to educated business owners, but they

are worthwhile for less-educated owners and tended to be adopted by those who had the will to learn about management. This result points to the importance of raising the valuation of trainings by participants before intervention as it would lead to better results.

The results of the quantile treatment regressions are shown in the two panels of Figure 7.2. We find that the magnitude of the treatment effect on the business score generally increases with the quantile of the initial business score. This trend holds true for both classroom training and on-site training. Assuming that rank reversals in the business practice distribution are not common, this result suggests that those business owners with higher business scores generally benefit more from the training that they receive. A possible interpretation is that the contents taught in our training programs were not too easy and required some degree of prior experience or knowledge to put into practice the lessons learnt.

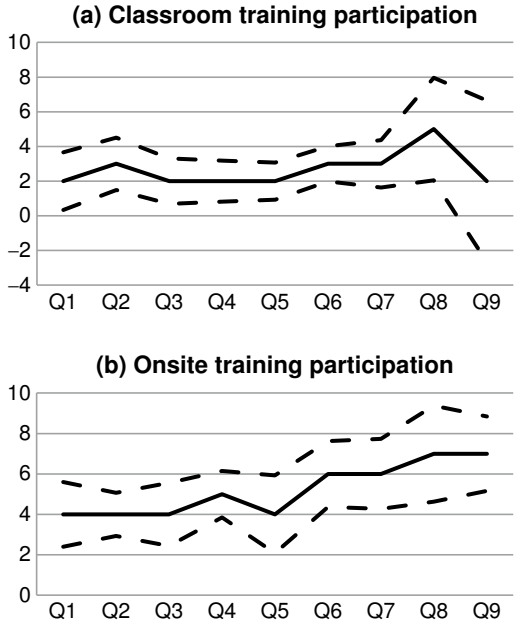

Figure 7.2 QTEs on business practice scores in the knitwear cluster near Hanoi
Notes: The solid lines are the QTEs and the dashed lines are 95% confidence interval. Bootstrapped standard errors are used. Each QTE is statistically significant at 1% level for Q2–8 in panel (a) and all quantiles in panel (b) and at 5% level for Q1 in panel (a). Out of the 36 possible combinations of any quantiles, we reject the equality of QTE for 4 combinations in panel (a) and 18 combinations in panel (b).

7.5 Conclusions

In this chapter, we have examined the impacts of managerial training programs undertaken in a classroom and on site. Our first finding is that the demand for these training programs by the entrepreneurs prior to the offer of the trainings was indeed low, but it increased greatly with their own experience of participation. This indicates that the lack of knowledge about the value of training may have been a barrier to business improvement not only in SSA but also in East Asia, such as Vietnam. Although we did not test for other potential reasons for constraints on the performance of MSEs, credit constraints were unlikely to be an important reason because all the entrepreneurs in our sample have assets that could be used as collateral, such as residential houses, workshop buildings, storehouses, sewing machines, knitting machines, motorcycles, and yarn and other intermediate materials. Rather, the concept of receiving management training in order to improve their business performance was new to them and, thus, they did not have any clear idea about where they could have received proper training, according to our interviews with them. We also found that the ex ante higher demand for training enhances the positive training impacts on the performance. This finding supports the importance of raising the awareness of the value of learning prior to training interventions.

Secondly, we found that the managerial training did indeed improve the business practices and the business performances of participating firms. The impact on business practice scores was greater for the on-site training than for the classroom training and there was also a compounding effect from participating in both trainings.

Finally, in examining the distribution of the training effect, we found that both classroom and on-site training programs were more beneficial for those at the higher quantiles in the business practice score distribution. These findings have critical policy implications for the government in developing countries and development aid agencies when they design training programs for SME managers in the future. More specifically, we would like to emphasize that it is highly recommendable to offer not only classroom training but also on-site training particularly for those who are keen about improved management practices.

8

Spillover Effects of Management Training in a Garment Cluster in Dar es Salaam, Tanzania

8.1 Introduction

In Tanzania, we conducted a new round of surveys of garment enterprises in March 2012. Although these enterprises are located in Dar es Salaam, they are not geographically as concentrated as in other clusters. We refer to this survey as the third follow-up survey because we conducted the first follow-up survey earlier in September 2010 after the classroom training program was completed and the second follow-up survey in March 2011 after the on-site training was completed. In this chapter, we report two sets of analyses on the impacts of the training programs on the management practices and business performance of the training participants: the first concerns knowledge spillovers and the second, the gender difference in training impacts.

During the training programs and follow-up surveys, we recognized that the participants talked to other participants and other persons including the non-participants in our sample. Such conversations would make our estimation of training impacts or causal inference difficult. To cope with this difficulty, our first and second follow-up surveys gathered data on how many of the participants each sample entrepreneur talked to about the training contents, especially *Kaizen*, during and after the training program. The first half of this chapter is devoted to the analysis of these data. We found that the knowledge understood by the participants was not stolen but conveyed to the non-participants, and that the understanding of the knowledge taught by the trainers was improved by discussions among the participants.

The second part of this chapter is devoted to the analysis of gender differences in management practices and business performance. There is an immense literature on gender differences in entrepreneurship and

business performance. More recently, some RCTs have revealed that female participants do not receive as much benefit as male participants from management training. After reviewing these preceding empirical studies briefly, this chapter analyzes the third follow-up survey data with special attention to gender differences in management skills, business performance, and training effects. We find that male and female entrepreneurs differ in the way and probably the purpose that they communicate with other entrepreneurs, and that this gender difference seems to have some bearing on the difference in the benefits that they received from the training programs.

The weakness of this chapter is that while the analysis of gender differences uses the third follow-up survey data, the analysis of conversation uses the second follow-up survey data. We have yet to integrate the two analyses by using the full set of all the survey data. The rest of this chapter is organized as follows. Section 8.2 reports the results of the analysis of conversations. Section 8.3 is devoted to a brief literature review of the above-mentioned issue of gender differences and the presentation of the findings from our data. Section 8.4 contains the summary of the results and the discussion of implications.

8.2 Conversations about the training

8.2.1 Diffusion of technology and management practices

The diffusion of new technology is an integral part of technological progress (e.g., Keller, 2004). In the context of rural areas in developing economies, researchers and practitioners have been interested in examining factors associated with the rapid diffusion of new agricultural technologies, such as modern varieties and new farming techniques, and recently a number of studies have focused on social networks as such a factor (e.g., Bandiera and Rasul, 2006; Conley and Udry, 2010). Duflo et al. (2011), however, provide evidence that maize farmers in Kenya do not learn from each other's experience of applying fertilizer, and Fafchamps and Söderbom (2011) find that social networks are not closely associated with agricultural technology diffusion in Ethiopia and Sudan. The reason why these mixed results have been obtained remains an open question.

Bloom and van Reenen (2011) argue that there may be genuine managerial innovations (e.g., Taylor's Scientific Management; Toyota's Lean Manufacturing System; Deming's Quality Movement) in the same way there are technological innovations. Likewise, the process in which an increasing number of enterprises adopt management practices that have

not been known to them may be similar to the process of technology diffusion. In their study of the adoption of total quality management (TQM), an innovative management practice, in a public hospital system in the USA, Young et al. (2001) find that various human networks among hospital workers and managers and institutional factors play as important roles as the characteristics of the top manager of each hospital in determining the adoption of TQM. As the mixed results concerning the adoption of agricultural technology suggest, however, social networks may not always be a major determinant of the adoption of innovative management practices. Thus, we have more to learn about how and when social networks facilitate the diffusion of management practices. Our RCTs of *Kaizen* management training may offer insights into this issue since *Kaizen* was new to the entrepreneurs in the garment industry in Dar es Salaam and since they had solid social networks with each other.

8.2.2 Data

Table 8.1 presents data on the network among the 106 entrepreneurs in our sample. Among them, 24 entrepreneurs were invited to both the classroom and on-site training programs, 25 were invited to only the classroom training program, and 28 were invited only to the on-site training program. Program take-up was very high, with 46 out of the 49 of those invited participating in the classroom training program, and with 100 percent of the invited entrepreneurs participating in the on-site training program. The total number of entrepreneurs who were treated in either program was 77, and the remaining 29 were not treated.

At the surveys, our enumerators visited either the workplace or residence of each respondent and conducted a personal interview for 45 to 60 minutes using a questionnaire. When the enumerators elicited information on networks, they showed the respondent a name list of the training participants and, while pointing at each name on the list, asked whether the respondent knew that participant personally, and whether the respondent had talked to him or her about the training during or after the training program. Our enumerators also collected the GPS coordinates of these entrepreneurs' enterprises to see which entrepreneurs were in the same neighborhood. Table 8.1 shows the results from the first follow-up survey in the upper panel and those from the second follow-up survey in the lower panel.

At the time of the first follow-up survey, those invited to the classroom training talked with 14.5 entrepreneurs about the training on average, but they knew several more in person, that is, the average number of acquaintances in the treatment group was 22.2 participants.

Table 8.1 Conversations and relations with the training participants by treatment status in the garment cluster in Dar es Salaam

	Treatment group		Control group	
	Mean	**SD**	**Mean**	**SD**
(A) Conversations after the classroom training (first follow-up survey)				
Number of observations	49		57	
Number of treated entrepreneurs that				
– the respondent talked to	14.5	9.3	1.9	3.6
– the respondent knew at least by name	22.2	10.5	10.6	9.2
– were within a 2-km radius from the respondent	3.3	3.1	3.8	3.2
(B) Conversations after the on-site training (second follow-up survey)				
Number of observations	77 (either classroom or on-site training program or both)		29 (neither program)	
Number of treated entrepreneurs that				
– the respondent talked to	19.0	14.3	6.9	8.7
– the respondent knew at least by name	31.0	16.0	17.3	11.4
– were within a 2-km radius from the respondent	5.4	4.3	6.8	4.7

Source: Own surveys.

The table also indicates that even the entrepreneurs in the control group knew as many as 10.6 participants in person, and moreover, they talked to 1.9 participants about the training. We also counted the number of participants who were living or operating their businesses within a 2-km radius of the respondent's residence or workplace. There were 3.3 such participants in the neighborhood of a participant and 3.8 in the neighborhood of a non-participant on average. When we conducted the second follow-up survey, we found that those invited to the classroom or on-site training program knew 31 other participants, and talked to 19 participants about at least one of the training programs, while the 29 entrepreneurs in the control group knew 17.3 participants in person and talked to 6.9 participants about the training.

We are interested in examining whether conversations about the training and other communication with participants affect the improvement in management practices and business performance. To measure management practices, our baseline and the first two follow-up surveys asked 24 questions, consisting of nine questions related to production

management (or *Kaizen* practices), six questions related to planning, five questions related to record keeping, and four questions about marketing, and we refer to the number of positive answers to these questions as the management-practice score.

Table 8.2 shows the mean management-practice scores by treatment status. At the baseline survey, there were no significant differences in the group average of the score among the four groups. However, the first follow-up survey, that is, after the classroom training, the treatment group (i.e., the first two groups) improved its score by a little less than 6 points, and the control group (i.e., the last two groups) improved its score by less than 2 points. The increases in the score between the two follow-up surveys were relatively small. While the first group was invited to the on-site training as well, its mean score increased only by 0.5 points. The third group, which received on-site training, increased its score by 2.9 points. The second group and the control group, which did not receive on-site training, increased its score by 0.5 points and 2.6 points, respectively. For the first two groups, their average scores at the second follow-up survey were more than 6 points higher than their respective baseline average scores. For the third group, the difference was 4.6 points. For the control group, it was as large as 4.2 points despite the fact that this group did not receive any training during the period under study. These results suggest that classroom training boosted the management-practice score more than on-site training did, and that there were considerable knowledge spillovers from the training participants to the non-participants.

Table 8.2 Management-practice scores by treatment status in the garment cluster in Dar es Salaam

	Invited to both training programs	**Invited to only the classroom training program**	**Invited to only the on-site training program**	**Control**
Baseline survey	12.4	11.2	10.9	10.2
After classroom survey	18.3	16.8	12.6	11.8
After on-site survey	18.8	17.3	15.5	14.4

Note: The highest possible score is 24 and the lowest is 0.

Source: Own surveys.

8.2.3 Impacts on management practices

To examine whether communicating with participants influences the improvements in management-practice score and business performance, we specified a regression equation as follows:

$$Y_i = \alpha_0 + \beta D_i + \gamma D_i Z_i + \delta(1 - D_i)Z_i + X_i\alpha_1 + \alpha_2 Y_{Bi} + \varepsilon_i, \quad (1)$$

where Y_i is either the management-practice score or the value added of entrepreneur *i*. Although we have a panel data set, equation (1) is applied to the cross section of entrepreneurs at the first follow-up survey soon after the classroom training and the cross section at the second follow-up survey soon after the on-site training, separately. We did not use the panel data simply because we have not come up with an appropriate specification of a dynamic mode in which management knowledge accumulates and human networks expand over time through training and communication with training participants.

The treatment status of entrepreneur *i* is denoted by D_i which is equal to 1 if the entrepreneur was invited to this training program and 0 otherwise. His or her social network is captured by Z_i which is either the number of participants with whom he or she talked to about the training, or the number of participants whom the entrepreneur *i* knew in person. In another specification, Z_i is the number of participants who are living or operating their business within a 2-km radius from him or her. The last three terms of equation (1) contain X_i, a vector of variables representing the background characteristics of entrepreneur *i*, and Y_{Bi}, the management-practice score in the past, as well as an error term ε_i. We include X_i and Y_{Bi} following the lead of McKenzie (2012).

According to equation (1), Y_i is higher by β if entrepreneur *i* was treated ($D_i = 1$) than if he or she was not treated, and it increases with Z_i at the rate of γ if he or she was treated and at the rate of δ otherwise. If D and Z were uncorrelated with error term ε, we could say that γ captures the effect of talking and listening to other participants on the treated and δ captures the effect of knowledge spillovers from participants on the untreated, while β captures the treatment effect on the treated apart from learning from other participants. The assumption that Z is exogenous, however, is unlikely to hold true. For example, the reason why some participants talked to other participants about the training may be that they expected their management to improve and hence were enthusiastic about the training. To take another example, whether Z represents the number of conversations or contacts, it may be correlated with the entrepreneur's sociability or communication skills, which is a desirable trait for entrepreneurs, but since this trait is not observable, it is included in error term ε. The purpose of including Z_i in the analysis is to

see if the null hypothesis of no association between Y_i and Z_i is rejected. We did not go into the causal inference.

Table 8.3 presents the results of estimation in equation (1) with the dependent variable Y_i being the overall management-practice score. Subsequent Tables 8.4 to 8.7 report the results obtained when Y_i is the partial score measuring marketing practices, record-keeping practices, planning practices, or production-management practices, respectively. These tables are designed in the same fashion. Our key variable Z_i varies according to the columns. It represents the number of participants with whom entrepreneur i talked to about the training in columns (1) and (2), the number of participants whom the entrepreneur knew in person in the next two columns, and the number of participants whose location was within a 2-km radius from the entrepreneur in columns (5) and (6). Columns (1), (3), and (5) report the estimates in the cross section after the classroom training, while columns (2), (4), and (6) report the estimates in the cross section after the on-site training.

In columns (1) and (2), where Z_i represents conversations about the training, the coefficient β on Treatment D_i is positive but its significance falls short of the 10 percent level. This result does not imply that the training did not have an impact on the management-practice score of the treated, because in these columns, both the coefficient γ on the interaction term D_iZ_i and the coefficient δ on the interaction term $(1 - D_i)Z_i$ are significant. Moreover, in columns (3) and (5), where the estimates of γ and δ are insignificant, the estimates of β are highly significant, even though the latter is not significant at all in columns (4) and (6). Thus, at least, the classroom training program had positive impacts on the management-practice score of the treated relative to that of the untreated.

As mentioned above, γ is highly significant in both columns (1) and (2). These results may be interpreted as indicating that the effects of both the classroom and on-site training programs were reinforced more as a participant talked to and listened to a greater number of other participants. The estimate of δ is significant at the 10 percent level in column (1) and at the 5 percent level in column (2), which may be interpreted as indicating that knowledge spillovers made the training beneficial even for the non-participants. Note, however, that we cannot be sure that these interpretations are correct as the causality may run from Y_i to Z_i. For example, those who expected or experienced management improvement might have talked to a number of participants about the training. These results, however, suggest that management improvement and discussion about the training are associated with each other. By contrast, the estimates of γ and δ are insignificant in columns (3) to (6), which indicates that neither participants nor non-participants could

Table 8.3 Factors associated with the overall management score in the garment cluster in Dar es Salaam

	Talked to		Known		Within 2-km radius	
	Classroom (1)	On-site (2)	Classroom (3)	On-site (4)	Classroom (5)	On-site (6)
Treatment *D*	1.403	0.099	2.872**	0.573	3.841***	0.779
	(1.45)	(0.09)	(2.10)	(0.36)	(3.67)	(0.55)
Treatment × communication *Z*	0.225***	0.104***	0.075	0.003	0.041	0.089
	(4.80)	(2.94)	(1.55)	(0.09)	(0.22)	(0.79)
Control × communication	0.226*	0.183**	0.030	0.029	–0.050	0.184
$(1 - D)Z$	(1.68)	(2.31)	(0.54)	(0.44)	(–0.33)	(1.27)
Age	0.028	–0.004	0.020	–0.019	0.013	–0.023
	(0.70)	(–0.10)	(0.45)	(–0.40)	(0.28)	(–0.49)
Female	0.540	–1.347	0.439	–1.159	0.781	–1.033
	(0.53)	(–1.18)	(0.37)	(–0.92)	(0.68)	(–0.86)
Years of schooling	0.240*	–0.089	0.257*	–0.100	0.228	–0.101
	(1.81)	(–0.59)	(1.70)	(–0.62)	(1.51)	(–0.64)
Parents' experience	–0.062	0.744	–0.231	0.719	–0.270	0.863
in the same trade	(–0.09)	(0.98)	(–0.30)	(0.89)	(–0.34)	(1.07)
Years of operation	–0.017	0.072	–0.019	0.083	0.001	0.085
	(–0.30)	(1.15)	(–0.29)	(1.23)	(0.02)	(1.29)

Any prior training (yes = 1)	–0.191	0.083	–0.065	–0.232	–0.036	–0.127
	(–0.46)	(0.18)	(–0.14)	(–0.48)	(–0.08)	(–0.27)
Former textile employee	0.270	–0.687	0.443	–0.290	0.447	–0.096
	(0.35)	(–0.80)	(0.52)	(–0.32)	(0.52)	(–0.11)
Chagga	–1.325*	0.256	–1.263	1.047	–1.066	1.024
	(–1.92)	(0.32)	(–1.62)	(1.28)	(–1.37)	(1.28)
ln(Distance to center)	0.253	0.081	0.165	–0.093	0.182	0.307
	(0.49)	(0.14)	(0.28)	(–0.15)	(0.26)	(0.42)
Management-practice score in the past Y_B	0.740***	0.480***	0.774***	0.665***	0.805***	0.675***
	(6.72)	(4.99)	(6.67)	(7.62)	(7.10)	(8.49)
Constant	–0.138	8.794***	–0.063	(–0.05)	(2.99)	(–0.02)
	(–0.05)	(2.99)	(–0.02)	0.703	0.578	0.627
Adjusted *R*-squared	0.661	0.518	0.574	0.454	0.563	0.466

Notes: The sample size is 106. Numbers in parentheses are *t*-statistics. ***Significant at 1% level, **at 5% level, and *at 10% level.

Table 8.4 Factors associated with the marketing practices score in the garment cluster in Dar es Salaam

	Talked to		Known		Within 2-km radius	
	Classroom (1)	On-site (2)	Classroom (3)	On-site (4)	Classroom (5)	On-site (6)
Treatment *D*	–0.100	–0.004	0.587	0.034	0.175	–0.007
	(–0.22)	(–0.01)	(0.97)	(0.07)	(0.38)	(–0.02)
Treatment × communication *Z*	0.053**	0.017*	0.012	–0.002	0.072	0.017
	(2.33)	(1.66)	(0.55)	(–0.22)	(0.85)	(0.46)
Control × communication (1 – *D*)*Z*	0.144**	0.063**	0.043*	0.008	0.015	0.039
	(2.41)	(2.45)	(1.79)	(0.37)	(0.22)	(0.83)
Age	0.000	0.005	0.002	–0.001	–0.003	–0.001
	(0.01)	(0.36)	(0.11)	(–0.04)	(–0.16)	(–0.07)
Female	–0.325	0.485	–0.458	0.637	–0.194	0.648*
	(–0.68)	(1.33)	(–0.89)	(1.62)	(–0.39)	(1.74)
Years of schooling	0.041	0.034	0.037	0.046	0.041	0.046
	(0.64)	(0.70)	(0.55)	(0.91)	(0.60)	(0.93)
Parents' experience in the same trade	0.042	0.005	–0.095	–0.005	–0.019	0.019
	(0.13)	(0.02)	(–0.28)	(–0.02)	(–0.05)	(0.08)
Years of operation	0.006	0.035*	–0.000	0.038*	0.005	0.037*
	(0.21)	(1.70)	(–0.01)	(1.76)	(0.18)	(1.78)
Any prior training (yes = 1)	–0.185	–0.161	–0.113	–0.186	–0.067	–0.159
	(–0.92)	(–1.10)	(–0.56)	(–1.21)	(–0.33)	(–1.05)

Former textile employee	–0.588	–0.113	–0.463	0.031	–0.393	0.079
	(–1.60)	(–0.40)	(–1.24)	(0.11)	(–1.03)	(0.27)
Chagga	–0.325	–0.260	–0.421	–0.077	–0.333	–0.090
	(–0.96)	(–1.02)	(–1.17)	(–0.30)	(–0.93)	(–0.35)
ln(Distance to center)	–0.136	0.388**	–0.199	0.383*	–0.051	0.468**
	(–0.55)	(1.99)	(–0.77)	(1.89)	(–0.16)	(1.99)
Management-practice score in the past Y_B	0.541***	0.501***	0.606***	0.580***	0.637***	0.582***
	(3.92)	(6.57)	(4.28)	(7.96)	(4.47)	(8.13)
Constant	1.286	–1.099	1.237	–0.996	1.166	–1.311
	(1.03)	(–1.17)	(0.95)	(–1.00)	(0.83)	(–1.23)
Adjusted *R*-squared	0.257	0.475	0.195	0.431	0.172	0.435

Notes: The sample size is 106. Numbers in parentheses are *t*-statistics. ***Significant at 1% level, **at 5% level, and *at 10% level.

Table 8.5 Factors associated with the record-keeping practices score in the garment cluster in Dar es Salaam

	Talked to		Known		Within 2-km radius	
	Classroom (1)	On-site (2)	Classroom (3)	On-site (4)	Classroom (5)	On-site (6)
Treatment *D*	0.348	0.045	0.379	0.094	0.808***	–0.039
	(1.12)	(0.20)	(0.95)	(0.29)	(2.74)	(–0.13)
Treatment × communication *Z*	0.029*	0.004	0.019	0.003	–0.015	0.014
	(1.98)	(0.68)	(1.38)	(0.53)	(–0.28)	(0.59)
Control × communication (1 – *D*)*Z*	0.013	0.012	0.004	0.008	0.000	0.002
	(0.31)	(0.70)	(0.23)	(0.61)	(0.00)	(0.06)
Age	0.006	–0.013	0.005	–0.014	0.003	–0.015
	(0.49)	(–1.38)	(0.42)	(–1.44)	(0.23)	(–1.56)
Female	0.713**	0.260	0.671**	0.234	0.751**	0.277
	(2.29)	(1.06)	(2.06)	(0.92)	(2.36)	(1.13)
Years of schooling	0.118***	–0.046	0.122***	–0.045	0.117***	–0.044
	(2.85)	(–1.43)	(2.92)	(–1.39)	(2.82)	(–1.38)
Parents' experience in the same trade	0.125	0.035	0.123	0.038	0.094	0.052
	(0.59)	(0.22)	(0.57)	(0.23)	(0.43)	(0.32)
Years of operation	–0.007	0.023*	–0.009	0.023	–0.003	0.024*
	(–0.42)	(1.73)	(–0.50)	(1.65)	(–0.17)	(1.78)
Any prior training (yes = 1)	0.248*	0.012	0.251*	–0.005	0.257**	0.000
	(1.90)	(0.12)	(1.97)	(–0.05)	(2.00)	(0.00)

Former textile employee	0.315	–0.158	0.312	–0.153	0.310	–0.135
	(1.25)	(–0.87)	(1.27)	(–0.83)	(1.25)	(–0.75)
Chagga	–0.397*	–0.258	–0.402*	–0.237	–0.346	–0.210
	(–1.82)	(–1.52)	(–1.81)	(–1.43)	(–1.57)	(–1.27)
ln(Distance to center)	0.278*	–0.035	0.272	–0.037	0.243	0.002
	(1.70)	(–0.27)	(1.65)	(–0.28)	(1.21)	(0.01)
Management-practice score in the past Y_B	0.496***	0.483***	0.491***	0.485***	0.493***	0.500***
	(5.70)	(7.31)	(5.71)	(7.38)	(6.01)	(8.01)
Constant	–1.366	2.626***	–1.319	2.609***	–1.209	2.608***
	(–1.60)	(4.22)	(–1.55)	(4.13)	(–1.32)	(3.85)
Adjusted *R*-squared	0.529	0.477	0.518	0.475	0.509	0.470

Notes: The sample size is 106. Numbers in parentheses are *t*-statistics. ***Significant at 1% level, **at 5% level, and *at 10% level.

Table 8.6 Factors associated with the planning practices scores in the garment cluster in Dar es Salaam

	Talked to		Known		Within 2-km radius	
	Classroom (1)	On-site (2)	Classroom (3)	On-site (4)	Classroom (5)	On-site (6)
Treatment *D*	1.143***	0.273	1.287**	0.462	1.673***	0.803
	(3.15)	(0.58)	(2.57)	(0.66)	(4.29)	(1.29)
Treatment × communication *Z*	0.062***	0.046***	0.020	0.007	0.028	0.057
	(3.44)	(3.26)	(1.10)	(0.59)	(0.40)	(1.13)
Control × communication (1 – *D*)*Z*	0.106**	0.062*	–0.009	0.010	–0.011	0.099
	(2.20)	(1.79)	(–0.43)	(0.34)	(–0.20)	(1.55)
Age	0.017	–0.013	0.014	–0.022	0.013	–0.025
	(1.10)	(–0.65)	(0.85)	(–1.04)	(0.81)	(–1.23)
Female	–0.027	–1.027**	0.039	–0.876	0.052	–0.769
	(–0.07)	(–2.08)	(0.09)	(–1.60)	(0.12)	(–1.50)
Years of schooling	0.095*	0.012	0.112**	0.019	0.098*	0.019
	(1.90)	(0.18)	(2.04)	(0.28)	(1.81)	(0.28)
Parents' experience in the same trade	0.099	0.401	0.046	0.420	0.042	0.516
	(0.39)	(1.21)	(0.17)	(1.19)	(0.15)	(1.46)
Years of operation	–0.004	0.014	–0.007	0.021	–0.002	0.024
	(–0.19)	(0.50)	(–0.28)	(0.69)	(–0.08)	(0.81)
Any prior training (yes = 1)	–0.120	0.016	–0.027	–0.081	–0.033	–0.032
	(–0.75)	(0.08)	(–0.16)	(–0.38)	(–0.20)	(–0.15)

Former textile employee	0.043	–0.254	0.154	–0.140	0.130	–0.067
	(0.15)	(–0.68)	(0.50)	(–0.35)	(0.41)	(–0.17)
Chagga	–0.371	0.261	–0.324	0.556	–0.310	0.561
	(–1.41)	(0.74)	(–1.12)	(1.52)	(–1.09)	(1.58)
ln(Distance to center)	–0.018	–0.083	–0.049	–0.152	–0.016	0.074
	(–0.09)	(–0.31)	(–0.23)	(–0.54)	(–0.06)	(0.23)
Management-practice score in the past Y_B	0.315***	0.144	0.390***	0.313***	0.401***	0.328***
	(3.24)	(1.29)	(3.79)	(2.90)	(3.89)	(3.23)
Constant	0.367	4.162***	0.317	4.133***	0.303	3.154**
	(0.36)	(3.23)	(0.29)	(2.98)	(0.26)	(2.16)
Adjusted *R*-squared	0.524	0.232	0.447	0.126	0.439	0.154

Notes: The sample size is 106. Numbers in parentheses are *t*-statistics. ***Significant at 1% level, **at 5% level, and *at 10% level.

Table 8.7 Factors associated with the production-management practices score in the garment cluster in Dar es Salaam

	Talked to		Known		Within 2-km radius	
	Classroom (1)	On-site (2)	Classroom (3)	On-site (4)	Classroom (5)	On-site (6)
Treatment *D*	0.657	–0.067	1.092**	0.392	1.588***	0.529
	(1.64)	(–0.14)	(1.99)	(0.54)	(3.73)	(0.80)
Treatment × communication *Z*	0.079***	0.069***	0.038*	0.016	–0.060	0.023
	(3.96)	(4.57)	(1.97)	(1.16)	(–0.78)	(0.42)
Control × communication (1 – *D*)*Z*	0.111**	0.064*	0.032	0.020	–0.057	0.032
	(2.10)	(1.78)	(1.45)	(0.66)	(–0.93)	(0.48)
Age	–0.013	0.010	–0.013	0.012	–0.018	0.010
	(–0.73)	(0.49)	(–0.72)	(0.52)	(–0.97)	(0.44)
Female	0.570	–0.787	0.433	–0.829	0.704	–0.644
	(1.35)	(–1.54)	(0.91)	(–1.42)	(1.51)	(–1.14)
Years of schooling	0.042	–0.035	0.056	–0.034	0.054	–0.032
	(0.74)	(–0.53)	(0.91)	(–0.47)	(0.87)	(–0.43)
Parents' experience in the same trade	–0.063	0.432	–0.125	0.485	–0.199	0.525
	(–0.22)	(1.28)	(–0.40)	(1.30)	(–0.62)	(1.38)
Years of operation	0.019	0.008	0.013	0.007	0.024	0.013
	(0.78)	(0.27)	(0.51)	(0.24)	(0.94)	(0.41)
Any prior training (yes = 1)	–0.048	0.278	0.016	0.095	0.061	0.126
	(–0.27)	(1.36)	(0.09)	(0.42)	(0.33)	(0.56)

Former textile employee	0.141	–0.039	0.211	0.069	0.200	0.130
	(0.43)	(–0.10)	(0.62)	(0.16)	(0.57)	(0.31)
Chagga	0.055	0.182	0.004	0.456	0.187	0.522
	(0.19)	(0.51)	(0.01)	(1.21)	(0.59)	(1.38)
ln(Distance to center)	0.066	–0.169	0.020	–0.328	–0.155	–0.279
	(0.30)	(–0.63)	(0.09)	(–1.11)	(–0.54)	(–0.81)
Management-practice score in the past Y_B	0.490***	0.280**	0.467***	0.539***	0.492***	0.599***
	(5.09)	(2.45)	(4.64)	(4.85)	(4.82)	(5.81)
Constant	1.976*	4.290***	2.030*	3.396**	2.662**	2.936*
	(1.73)	(3.15)	(1.67)	(2.26)	(2.01)	(1.81)
Adjusted *R*-squared	0.519	0.419	0.441	0.292	0.415	0.282

Notes: The sample size is 106. Numbers in parentheses are *t*-statistics. ***Significant at 1% level, **at 5% level, and *at 10% level.

benefit from just knowing some participants in person or from being located near other participants.

From Tables 8.4 to 8.7, the results of the regressions of the partial management scores on the same set of explanatory variables are reported. The qualitative results concerning coefficients δ, γ, and δ shown in these tables are almost the same as those in Table 8.3. These tables, however, differ in the results with regard to the estimated effects of schooling, prior training, and distance to the city center. While the estimated effects of these variables are all insignificant in Table 8.3, those of distance are significant at the 5 percent level in columns (2), (4), and (6) in Table 8.4. This is probably because the on-site training participants who were located relatively far from the city center received some advice from the instructors as to how to overcome disadvantages in marketing.

The number of years of schooling has highly significant coefficients in columns (1), (3), and (5) of Table 8.5 and marginally significant coefficients in the same columns of Table 8.6. These results suggest that formal education helps entrepreneurs improve their record-keeping and business planning practices. In Table 8.5, the dummy variable indicating whether the entrepreneur had attended any other business training program has marginally significant coefficients in the odd-numbered columns. The coefficients of schooling and prior training, however, are not significant in columns (2), (4), and (6), but the insignificance does not imply that the improved practices of relatively highly educated entrepreneurs were short-lived. The increases in score due to the classroom training may be absorbed in Y_{Bi} in the even-numbered columns, and in the on-site training, record-keeping practices and planning were not as emphasized as in the classroom training.

In Table 8.7, where the dependent variable is the (*Kaizen*) production-management score, no explanatory variables other than D_i, D_iZ_i, $(1 - D_i)Z_i$, and Y_{Bi} have significant coefficients. This result is consistent with the hypothesis that even those without high education and prior training can understand *Kaizen* production management, to which a large part of classroom and on-site training programs was devoted. Such management progress exerts impacts on production either directly or indirectly through information spillover effects.

8.2.3 Impacts on profits

In Table 8.8, the dependent variable is profit, which is defined here as revenue minus material cost, subcontracting cost, utility cost, and labor cost. The data on profit were collected in the baseline survey and the second follow-up survey, but not in the first follow-up survey. Thus, we

Table 8.8 Factors associated with profits in the garment cluster in Dar es Salaam

	Talked to	**Known**	**Within 2-km radius**
	(1)	**(2)**	**(3)**
Treatment D	77.6	1,151.4	616.5
	(0.09)	(0.96)	(0.56)
Treatment × communication Z	59.1***	13.1	37.9
	(2.71)	(0.63)	(0.43)
Control × communication $(1 - D)Z$	24.7	28.5	–29.4
	(0.40)	(0.58)	(–0.26)
Age	–12.9	–18.1	–22.5
	(–0.37)	(–0.50)	(–0.62)
Female	–1,576.8*	–1,494.7	–1,263.8
	(–1.79)	(–1.58)	(–1.40)
Years of schooling	148.5	163.6	173.6
	(1.28)	(1.37)	(1.46)
Parents' experience in the same trade	–491.8	–376.5	–343.8
	(–0.83)	(–0.61)	(–0.55)
Years of operation	77.3	84.5	90.4*
	(1.57)	(1.64)	(1.78)
Any prior training (yes = 1)	–17.1	–176.3	–148.9
	(–0.05)	(–0.48)	(–0.41)
Former textile employee	–549.6	–548.4	–511.6
	(–0.82)	(–0.78)	(–0.74)
Chagga	733.6	859.5	963.5
	(1.19)	(1.38)	(1.55)
ln(Distance to center)	–415.9	–567.1	–488.6
	(–0.88)	(–1.17)	(–0.86)
Management-practice score in the past Y_B	0.2	0.3	0.3
	(1.42)	(1.63)	(1.57)
Constant	1,029.4	950.2	1,300.8
	(0.45)	(0.40)	(0.51)
R-squared	0.256	0.202	0.198
Adjusted R-squared	0.1506	0.0888	0.0849

Notes: The sample size is 106. Numbers in parentheses are t-statistics. ***Significant at 1% level, **at 5% level, and *at 10% level.

use cross-section data after the on-site training (i.e., the second follow-up survey data) while controlling the initial profit level. The treatment dummy variable is equal to 1 if the entrepreneur was invited to either the classroom or the on-site training program. In this table, only three coefficients have significance at least at the 10 percent level, and even the

coefficient on the initial management proactive score is insignificant. The single most important finding from this table is that the profits of the participants increased with the number of conversations with other participants about the training. This result reinforces the finding that the improvement in management practices and the number of such conversations are positively associated with each other.

8.3 Test of the female underperformance hypothesis

8.3.1 A brief literature review

There are an increasing number of studies on female entrepreneurship in both developing and developed countries since the early 1990s, spurred by the growth in the number of female-owned enterprises (Acs et al., 2011; Aidis et al., 2007). Many of these studies look at gender gaps, that is, some differences in behavior or performance between enterprises operated by female entrepreneurs and male entrepreneurs. The literature has considered the gender gaps in terms of the perceptions of entrepreneurship (Díaz-García and Jiménez-Moreno, 2010); the likelihood that a loan application is accepted (Buttner and Rosen, 1988, 1989); enterprise size, survival, and growth (Chaganti and Parasuraman, 1996; Cooper et al., 1994; Fischer, 1992; Fischer et al., 1993); management (Barua et al., 2010; Chaganti, 1986; Sexton and Bowman-Upton, 1990; Thiruvadi and Huang, 2011); and social networks (Buttner, 1993; Campbell and Lee, 1990; Cromie and Birley, 1992; Hanson and Blake, 2009; Reevy and Maslach, 2001; Rosenthal and Strange, 2012), among other issues.

Some of these studies find that female businesses are less profitable, grow less rigorously, and are more likely to cease operation than their male counterparts (Cooper et al., 1994; Fischer, 1992; Fisher et al., 1993; Rosa et al., 1996; Watson, 2001). Some other studies, however, argue that female underperformance is negligible if confounding factors are controlled for (Díaz-García and Brush, 2012; Du Rietz and Henrekson, 2000; Kalleberg and Leicht, 1991; Robb and Watson, 2012). An example of a confounding factor is that female entrepreneurs tend to cluster in the sectors in which enterprises are smaller and less productive. Moreover, female entrepreneurs are more likely to be part-time workers, as observed in the UK (Parker, 2009), which is another confounding factor. As Acs et al. (2011) note, the majority of these studies compare the performance of female and male businesses in developed countries. The extent to which their findings can be applied to developing countries remains an open question.

Female entrepreneurs in developing countries are said to be more constrained by cultural and social factors (Amine and Staub, 2009; Langowitz and Minniti, 2007). It is no wonder that more recent studies ask whether female entrepreneurs underperform relative to male entrepreneurs in developing countries and explore the underlying reasons (e.g., Bardasi et al., 2011; Klapper and Parker, 2011). As in developed countries, it is also true in developing countries that enterprises run by females are substantially smaller in operation size, and this is partly because female entrepreneurs cluster in the sectors where enterprises are typically smaller and less productive (e.g., Bardasi et al., 2011; Singh et al., 2001).

In developing countries, there have been an increasing number of projects sponsored by donor agencies specifically targeting female entrepreneurs with a view to closing the gender gap. The projects mostly focus on microfinance and more recently management training provided for female entrepreneurs exclusively or in sectors dominated by female entrepreneurs. Some of these projects include randomized experiments designed to evaluate the efficacy of management training or financial grants on the performance of enterprises (e.g., Berge et al., 2011; de Mel et al., 2008, 2010; Fafchamps et al., 2011; Giné and Mansuri, 2011; Karlan and Valdivia, 2011; Klinger and Schündeln, 2011). These studies commonly find that female entrepreneurs tend to benefit less from treatment than male entrepreneurs, whether the treatment is the provision of management training or the provision of microfinance.[1] These findings raise the question of what explains the weaker impacts of the training programs on female participants.

Two explanations have been offered to explain the lower impact of both microfinance and managerial training programs on female entrepreneurs. First, Giné and Mansuri (2011) point to the lack of control by female entrepreneurs over major decisions in their enterprises, which happens to many female entrepreneurs in developing countries because their enterprises are owned by their spouses, parents, or relatives, who make major decisions, such as decisions on business expansion. Such female entrepreneurs cannot make good use of the knowledge that they have acquired from the training programs in which they participated.[2]

Second, there may be gender differences in behavioral traits, such as risk attitude (Croson and Gneezy, 2009; Holt and Laury, 2002), time preference (Dohmen et al., 2010; Harrison et al., 2002), and willingness to compete (Croson and Gneezy, 2009; Niederle and Vesterlund, 2007). In the context of training specifically, Berge et al. (2011) find that female entrepreneurs benefit less from a training program than male entrepreneurs, and that female entrepreneurs are much less willing to compete

than male entrepreneurs, which the authors argue "may constitute an 'internal' constraint on business growth" (p. 18).[3]

While these explanations sound plausible, they may not be the only possible explanations. Moreover, one may question the generalizability of the finding that female entrepreneurs benefit less from business training than their male counterparts. Although this is a common finding of existing studies on business training, such studies are still few in number. A considerably further compilation of empirical studies in different industries in different countries is called for on the issue of female underperformance in learning from management training as well as the female underperformance in terms of enterprise size and growth.

8.3.2 Data

A feature of the garment industry in Dar es Salaam is the predominance in the number of female-owned enterprises. Moreover, female entrepreneurs' performance seems as good as male entrepreneurs' to casual observers, and female participants in our training programs appeared as enthusiastic about learning *Kaizen* as their male counterparts. This section attempts to investigate whether the female entrepreneurs in this industrial cluster operate smaller businesses and benefit less from the training programs than the male entrepreneurs. In this analysis, we used the new data collected through the third follow-up survey which was conducted in March 2012. In this survey, we tried to collect data on the behavioral traits of the sample entrepreneurs, including risk attitude, present bias, willingness to compete, and cognitive ability. We obtained reliable data on these items from 102 sample entrepreneurs except for the time preference. Compared with the second follow-up survey, there were four cases of attrition. Table 8.9 shows the breakdown of the 102 sample entrepreneurs by gender and by treatment status.

Table 8.9 Third follow-up survey sample sizes by gender in the garment cluster in Dar es Salaam

	Female	**Male**	**Total**
Invited to the classroom training program only	20	3	23
Invited to the on-site training program only	24	2	26
Invited to both programs	22	2	24
Invited to neither program	23	6	29
Total	89	13	102

Source: Own surveys.

Table 8.10 shows the characteristics of the entrepreneurs by gender at the baseline survey. The female entrepreneurs, who account for about 85 percent of the sample, are significantly older, are more likely to have experience of receiving business training before our training program started, and are less likely to have experience in working at textile or garment factories as employees than their male counterparts. Many of the female entrepreneurs in this industry started their businesses after attending a training program, which was provided repeatedly by UNIDO mainly, but not exclusively, for female would-be entrepreneurs in Dar es Salaam in the 1990s. This training program covered a wide scope of skills ranging from sewing skills to book-keeping and business planning.

Table 8.10 Characteristics of entrepreneurs by gender in the garment cluster in Dar es Salaam

	Female	**Male**	**Female–Male difference (SE)**
Number of observations	89	13	
Age	45.8	37.9	7.9***
			(2.29)
Prior training experience	0.71	0.31	0.40**
			(0.05)
Former textile employee	0.19	0.54	–0.35**
			(0.15)
Chagga tribe	0.29	0.15	0.14
			(0.11)
Years of schooling	10.8	10.1	0.7
			(0.86)
Years of operation	9.2	10.4	–1.2
			(2.52)
Distance from center (km)	8.24	6.53	1.71
			(1.05)
With parents in the same trade [0 or 1]	0.27	0.23	0.04
			(0.13)
Social network	38.1	23.1	15.0***
			(5.15)
Own another business	0.38	0.15	0.23*
			(0.12)

Notes: The third column shows the results of the two-tailed *t*-test for the difference in the means. ***Significant at 1% level, **at 5% level, and *at 10% level.

Source: Own surveys.

Many of the participants in the UNIDO program encouraged their friends to participate in the same program and other business-development service programs offered by NGOs. This seems to be the most important reason why there is a multitude of female entrepreneurs in the garment industry in Dar es Salaam. By contrast, male entrepreneurs were much less likely to have training experience. Seven out of 13 male entrepreneurs used to be employees of the textile companies and started their businesses after losing their jobs in the wake of the economic reforms in the 1990s.

Gender differences in the years of schooling, years in operation, and the parents' experience in the same trade are not statistically significant. The Chagga, who are born business persons known for being hardworking, account for 29 percent of the female sample and 15 percent of the male sample, but this difference is not significant. The male entrepreneurs are slightly better located in terms of the proximity to the city center, but the significance of the gender difference in this respect falls short of the 10 percent level.

Turning to social networks, on average, female entrepreneurs knew 38 other entrepreneurs in our sample while male entrepreneurs knew only 23 entrepreneurs in the sample. The difference is highly significant. According to our interviews with the entrepreneurs in our sample, they communicated with their contacts to share information about "the next trade fair" and "the next short-term training programs made available by NGOs or other organizations" which allowed them to congregate. Another gender difference is found in sideline business. While only two out of 13 (or 15 percent of) male entrepreneurs had sideline businesses, 38 percent of female entrepreneurs had one or more sideline businesses in addition to their garment workshops. The significance of the difference is near the 5 percent level.

8.3.3 Business performance

The next two tables concern the hypothesis of female underperformance with respect to business performance. Table 8.11 presents the baseline data on revenues, value added, profit, and the number of workers by gender. The largest male-owned enterprise is by far larger than the largest female-owned enterprise. If, however, the median revenue in the female sample is compared with that in the male sample, the difference is TSH 500,000 which is only 7 percent of the female median revenue. Similarly, the female median is not much different from the male median with respect to value added and profit. The male and female samples share the

Table 8.11 Enterprise sizes before the training programs by gender in the garment cluster in Dar es Salaam

		Revenue	Value added	Profit	Number of workers
Female sample	Max	119,783	80,267	77,160	22
	Median	7,300	4,028	2,220	4
	Mean (excluding Max)	10,347	6,197	4,217	4.3
Male sample	Max	172,280	140,600	114,680	31
	Median	7,801	5,146	2,610	4
	Mean(excluding Max)	15,279	8,401	4,018	6.9
Female–male difference in means (SE)		–4,932 (4,648)	–2,204 (2,781)	–199 (1,855)	–2.6 (2.22)

Notes: Revenue, value added, and profit shown are in TSH 1,000. Numbers in parentheses are standard errors (SEs).

Source: Own surveys.

same median number of workers. If the largest male enterprise and the largest female enterprise are excluded from the sample, the means are not significantly different between the two samples. Moreover, the mean profit is slightly greater for the female sample. Since the performance of the female entrepreneurs was as good as that of the male entrepreneurs, the female underperformance hypothesis does not seem to hold true in this garment cluster. One possible explanation for this finding is that many of the female entrepreneurs started their businesses after receiving intensive business training. Although much less intensive than the training of Bangladeshi garment workers in Korea (see Chapter 2), this case also suggests the importance of training in initiating new business.

Table 8.12 shows the data on the percentages of sales revenue from domestic trade fairs, foreign trade fairs, and exporting to foreign markets through channels other than trade fairs. The business associations with which the sample entrepreneurs are affiliated hold trade fairs in cities in Tanzania and the neighboring countries in collaboration with similar associations in those countries. Participants in a foreign trade fair travel for typically over 24 hours taking the bus arranged by their association. The bus also transports their products, which they display and sell

Table 8.12 Contributions of domestic and foreign trade fairs to sales revenue in the garment cluster in Dar es Salaam

	Domestic trade fairs	Foreign trade fairs	Other foreign markets
Female	15.2	20.3	7.7
Male	3.0	2.2	3.9
Difference	12.2***	18.1***	3.8
	(3.39)	(3.27)	(3.62)

Notes: The sample size is 102 (89 females and 13 males). ***Significant at 1% level.

Source: Own surveys.

during the fair. While male entrepreneurs seldom participate in trade fairs, many female entrepreneurs are regular participants. A long journey gives the participants an opportunity to catch-up with friends on the latest events in their business community. As we saw in Table 8.10, female entrepreneurs are on average 45.8 years old and their children do not need much care. Thus, many of them can be absent from home for long stretches of time to attend trade fairs. For these reasons, female entrepreneurs are more active in participation in trade fairs and hence in exporting. In view of Tables 8.11 and 8.12, female entrepreneurs do not underperform in terms of enterprise size, profitability, and exporting in this industrial cluster.

8.3.4 Behavioral traits

Table 8.13 presents the data on the behavioral traits of the entrepreneurs. To measure the preference for relative evaluation, we asked the entrepreneurs the following hypothetical question: "If you were an employee of an enterprise or government office, would you rather be paid on the basis of your performance relative to the performance of other employees or only on the basis of your own performance independent of other employees?" The preference of relative evaluation can be viewed as the willingness to compete, according to Gneezy et al. (2009).[4] While Berge et al. (2011) find from their sample of micro-credit clients in Tanzania that females are much more reluctant to compete, we did not find any significant gender difference in this respect. To examine the willingness to pay or the preference of relative evaluation, we used the hypothetical question, but Berge et al. (2011) used an artifactual field experiment involving actual payments. Thus, the contrasting findings about the existence of a gender difference in such a preference can be attributed not only to the difference in the methodology used but also

Table 8.13 Behavioral traits by gender in the garment cluster in Dar es Salaam

	Female	Male	F–M difference (SE)
Preference for relative evaluation [0 or 1]	0.45	0.62	–0.17 (0.15)
Risk-taking propensity [0 to 10]	8.69	8.08	0.61 (0.48)
High cognitive ability [0 or 1]	0.42	0.31	0.11 (0.14)
Present bias [0 to 10]	9.06	8.85	0.21 (0.88)
Business purpose is strictly to make profit	0.53	0.62	–0.09 (0.15)

Note: The sample size is 102 (89 females and 13 males).

Source: Own surveys.

to the difference in the type of entrepreneurs: our sample entrepreneurs operate much bigger businesses than the microfinance clients.

We measured the risk-taking propensity on a scale of 0 to 10, where the values 0, 5, and 10 indicate that the entrepreneur is "not willing to take even the slightest risk," "risk neutral," and "very willing to take risks," respectively. We took this simple approach rather than conducting a costly and time-consuming laboratory experiment with lottery choices, following the lead of Dohmen et al. (2011), who find that asking questions about risk-taking behavior in general produces the best predictor of risk attitude. To measure cognitive ability, we asked the entrepreneurs to solve five simple mathematical questions and classified those who answered four or five questions correctly as high-ability entrepreneurs. To measure present bias, we conducted a simple experiment and obtained an index on a scale of 0 to 10, with the extent of present bias increasing with the index. Overall, we did not find any significant gender differences in these measures of behavioral traits.

According to our personal interviews with the sample entrepreneurs, many female entrepreneurs entered into entrepreneurship to seek financial independence from their husbands. By contrast, all the male entrepreneurs in our sample were the breadwinners of their families. Regrettably, our questionnaire did not include "to earn an income at your own disposal" as a possible answer. Instead, our respondents were asked whether or not their business purposes are strictly to make profits, to which these females answered affirmatively. As a result, we did not observe a gender difference in business purpose in Table 8.13. Another often heard

motivation for females who are or who go into entrepreneurship was to seek a break from household chores by socializing with other females in areas such as entrepreneur associations.

8.3.5 Male catch-up

In the baseline survey and the first two follow-up surveys, we asked 24 questions about management practices to develop a management-practice score on a scale from 0 to 24. In the third follow-up survey, however, we had to reduce the number of management practice questions to 17 in order to ask many new questions to measure cognitive ability, risk attitudes, patience, and so forth. The results are shown in Table 8.14,

Table 8.14 Management-practice scores by gender on a scale from 0 to 17 in the garment cluster in Dar es Salaam

	Record keeping [0 to 5]	Marketing [0 to 5]	Production and quality management [0 to 7]	Overall management score [0 to 17]
Baseline survey				
Female	3.6	1.6	3.7	8.9
Male	2.8	0.3	3.8	6.9
Difference	0.78*	1.32***	–0.04	2.06***
	(0.41)	(0.22)	(0.35)	(0.70)
First follow-up survey (after classroom)				
Female	4.2	2.5	4.7	11.3
Male	2.8	2.0	4.5	9.2
Difference	1.40**	0.46	0.22	2.08*
	(0.49)	(0.50)	(0.30)	(1.08)
Second follow-up survey (after on-site)				
Female	4.5	2.6	5.1	12.2
Male	3.6	2.0	5.1	10.7
Difference	0.85*	0.63	0.02	1.50
	(0.47)	(0.56)	(0.49)	(1.32)
Third follow-up survey (latest)				
Female	4.9	3.4	5.3	13.6
Male	4.2	3.5	5.3	13.0
Difference	0.62	–0.02	–0.02	0.58
	(0.43)	(0.40)	(0.49)	(1.08)

Notes: The sample size is 102 (89 females and 13 males). The numbers in parentheses are SEs. ***Significant at 1% level, **at 5% level, and *at 10% level.

Source: Own surveys.

where the perfect score is 17. In each of the three areas of management, both female and male average scores increased over time. The overall score increased from 8.9 to 13.6 for the females and from 6.9 to 13.0 for the males. These increases are largely attributable to our training programs.

At the baseline survey, the female entrepreneurs scored significantly higher than the male entrepreneurs in the record-keeping and marketing areas. This is probably because many female entrepreneurs started their businesses after receiving good training, especially the one provided by UNIDO. The difference in marketing, however, became insignificant in the first follow-up survey and from that time onward. The difference in record keeping became insignificant as well in the third follow-up survey. Such catch-up by the males is not observed in the production and quality-management area, where the female and male entrepreneurs share almost the same average scores from the beginning, but it is evident in terms of the overall score, of which the gender difference was conspicuous at the baseline survey and became completely insignificant at the last survey.

Thus, female underperformance in benefiting from management training exists in the sense that female entrepreneurs had smaller increases in the management-practice score than male entrepreneurs.[5] The rapid increases in the male entrepreneurs' scores, however, may be attributed to their lower initial scores, and we are not sure whether it is appropriate to view the male catch-up as female underperformance.

8.3.6 Characteristics associated with the baseline management-practice score

Table 8.15 presents the results of the OLS regression of the management score at the baseline survey, which was about the background characteristics of the entrepreneurs so as to examine to what extent the difference in the initial score can be attributed to characteristics other than gender. As we saw in Table 8.13, the female entrepreneurs had scored significantly higher than the male entrepreneurs in the areas of record-keeping practices and marketing practices. The coefficient on the female dummy, however, is insignificant in column (1) because part of the gender difference is absorbed by some other variables, even though it remains highly significant in columns (2) and (4).

The coefficients on the age variable are negative and generally insignificant, reflecting a weak tendency of younger entrepreneurs to score higher. The Chagga dummy has positive and significant coefficients on the record-keeping score and the marketing score, which is consistent with the reputation of Chagga people as born traders. According to

Table 8.15 Characteristics associated with the baseline management-practices score in the garment cluster in Dar es Salaam

	Record keeping [0 to 5]	Marketing [0 to 5]	Production and quality management [0 to 7]	Overall management score [0 to 17]
	(1)	(2)	(3)	(4)
Female dummy	0.521	1.250***	–0.067	1.705**
	(1.11)	(4.00)	(–0.18)	(2.29)
Age	–0.025	–0.022	–0.020	–0.068*
	(–1.66)	(–1.27)	(–1.17)	(1.86)
Chagga tribe	0.469**	0.598**	–0.174	0.893*
	(2.13)	(2.14)	(–0.63)	(1.78)
Years of schooling	0.042	0.016	–0.007	0.051
	(0.78)	(0.34)	(–0.16)	(0.50)
Former textile employee	–0.591*	–0.307	0.125	–0.773
	(–1.81)	(–0.91)	(0.40)	(–1.30)
With parents in the same trade	0.145	0.293	0.281	0.718
	(0.63)	(0.99)	(1.12)	(1.45)
Willingness to compete	0.033	0.138	0.080	0.251
	(0.13)	(0.49)	(0.29)	(0.44)
High cognitive ability	–0.302	–0.093	0.184	–0.211
	(–1.14)	(–0.35)	(0.69)	(–0.42)

Business purpose is strictly to make profit	–0.202	–0.367	–0.250	–0.819
	(–0.71)	(–1.22)	(–0.91)	(–1.43)
Prior training experience	0.268	0.190	0.346*	0.803**
	(1.57)	(1.06)	(1.71)	(2.32)
Years of operation	0.011	0.050**	0.033	0.094**
	(0.37)	(2.30)	(1.65)	(2.09)
ln(Distance to center)	0.079	–0.155	0.207	0.131
	(0.37)	(–0.65)	(0.90)	(0.30)
Constant	3.382***	0.860	3.748***	7.990***
	(3.07)	(0.87)	(3.45)	(3.67)
R-squared	0.205	0.270	0.128	0.289

Notes: The sample size is 102. Numbers in parentheses are *t*-statistics. ***Significant at 1% level, **at 5% level, and *at 10% level.

Table 8.10, the female entrepreneurs are more likely to be Chagga than the male entrepreneurs, even though the significance of the difference falls short of 10 percent. The coefficient on the former textile employee dummy is negative and marginally significant in column (1), which suggests that former textile employees tended to have started their businesses without acquiring management skills.

The management training that the entrepreneurs received in the past is positively associated with the management-practice score because the coefficient on the prior training experience dummy is significant at the 5 percent level in column (4), even though it is not significant at the 10 percent level in columns (1) and (2). Note, however, that part of the effect of the training is absorbed by the female dummy because some training programs were exclusively provided for female entrepreneurs. The experience in operating a business is associated with the marketing score as well as the overall management-practice score, and it is also weakly associated with the production- and quality-management scores. Overall, it is difficult for the regression approach to explain well the gender difference in the baseline level of the management-practice score in terms of the observable characteristics, and at least part of the difficulty seems to come from the fact that the training programs from which many female entrepreneurs benefited were provided exclusively for the female would-be entrepreneurs.

8.3.7 Estimated ITT effects on the management score and business performance

In Tables 8.16 and 8.17, we examined the impacts of the training programs on the management-practice score and business performance on the treated by using the ITT estimator. To estimate the impacts of the two programs combined, we used the baseline data and the third follow-up survey data. We use T to denote the time period after the training. In Panel A of Table 8.16, columns (1) and (2) indicate that the record-keeping score and marketing score of the untreated entrepreneurs (i.e., those who were not invited) increased after the training program by 0.793 points and 1.149 points, respectively, and that the scores of the treated entrepreneurs increased further by 0.268 points and 0.222 points, respectively, even though these differences between the treated and the untreated were insignificant. In columns (3) and (4), the coefficient on T is highly significant, indicating that production management and the overall scores of the untreated entrepreneurs increased substantially, and the significant coefficient on the interaction term, Invite × T, indicates that the treated entrepreneurs had even higher scores after the training

Table 8.16 ITT effects on management scores: Fixed-effects model estimates in the garment cluster in Dar es Salaam

Variables	(1)	(2)	(3)	(4)
	Record keeping [0 to 5]	**Marketing [0 to 5]**	**Production and quality management [0 to 7]**	**Overall management score [0 to 17]**
(A) Homogeneous treatment effects				
T	0.793***	1.149***	0.851***	2.793***
	(3.23)	(6.70)	(3.80)	(7.08)
Invited × *T*	0.268	0.222	0.635**	1.125**
	(1.00)	(1.03)	(2.33)	(2.33)
Constant	3.471***	1.569***	3.812***	8.852***
	(47.37)	(22.02)	(43.60)	(56.43)
R-squared	0.280	0.314	0.281	0.446
(B) Gender heterogeneous treatment effects				
T	–0.111	1.556***	–0.111	1.333
	(–0.15)	(4.31)	(–0.41)	(1.29)
Female × *T*	1.140***	–0.512	1.213***	1.841*
	(2.52)	(–1.26)	(3.30)	(1.67)
Invited × *T*	1.763**	1.010*	2.329***	5.101***
	(2.26)	(1.83)	(4.47)	(3.93)
Female × Invited × *T*	–1.792**	–0.805	–2.020***	–4.618***
	(–2.19)	(–1.35)	(–3.37)	(–3.34)
Constant	3.470***	1.567***	3.810***	8.846***
	(49.35)	(23.01)	(45.06)	(59.59)
R-squared	0.303	0.336	0.297	0.467

Notes: The sample size is 102. Numbers in parentheses are *t*-statistics. ***Significant at 1% level, **at 5% level, and *at 10% level.

than the untreated ones. Although there is no direct evidence, the positive and highly significant coefficients on *T* from columns (1) to (4) are likely to reflect spillovers from the training participants to the non-participants, according to the results discussed in the previous section. Note also that the training effects captured by the positive coefficients on Invite × *T* include the participants' learning from the conversations with other participants, as discussed in the previous sections.

Panel B of Table 8.16 presents the results of the analysis of the gender heterogeneous effects of the training. Except for column (2), the coefficients on *T* are insignificant, indicating that the untreated male entrepreneurs' scores did not increase after the training programs, which in turn suggests that they did not benefit from knowledge spillovers from the participants. By contrast, the untreated female entrepreneurs' scores increased substantially, as indicated by the significant coefficients on the interaction term, Female × *T*, in columns (1), (3), and (4). Thus, it is likely that while the female untreated entrepreneurs

Table 8.17 ITT effects on business performance in the garment cluster in Dar es Salaam: Fixed-effects model estimates, 2009 and 2011

	(1)	(2)
	Annual revenue	**Annual value added**
(A) Homogeneous treatment effects		
T	4,263.5	343.0
	(1.42)	(0.13)
Invited × *T*	5,840.1*	4,885.3
	(1.66)	(1.51)
Constant	10,975.9***	6,477.8***
	(14.08)	(8.20)
R-squared	0.244	0.073
(B) Gender heterogeneous treatment effects		
T	43.3	–4,993.4
	(0.05)	(–1.31)
Female × *T*	5,321.2	6,728.5
	(1.37)	(1.38)
Invited × *T*	21,473.1*	24,209.6
	(1.68)	(1.49)
Female × Invited × *T*	–17,944.4	–22,200.0
	(–1.34)	(–1.34)
Constant	10,975.9***	6,477.8***
	(14.35)	(8.45)
R-squared	0.278	0.136

(*Continued*)

Table 8.17 (*Continued*)

	(1)	(2)
	Annual revenue	**Annual value added**
(C) Interaction with business motive is strictly profit making (PM)		
Invited × *T*	14,233.5	10,507.6
	(1.02)	(1.13)
Female × Invited × *T*	–14,088.2	–13,848.5
	(–0.97)	(–1.43)
PM × Invited × *T*	10,509.4	21,729.2
	(0.48)	(0.88)
PM × Female × Invited × *T*	–2,224.0	–10,067.0
	(–0.09)	(–0.39)
R-squared	0.301	0.170
(D) Interaction with high cognitive score (HCS)		
Invited × *T*	30.7	–1,257.0
	(0.01)	(–0.25)
Female × Invited × *T*	3,169.7	5,865.5
	(0.43)	(0.82)
HCS × Invited × *T*	50,430.7**	74,308.2**
	(2.53)	(2.52)
HCS × Female × Invited × *T*	–49,471.1**	–80,273.4***
	(–2.32)	(–2.67)
R-squared	0.415	0.318
(E) Interaction with willingness to compete (WTC)		
Invited × *T*	21,366.8**	24,900.1***
	(2.42)	(2.97)
Female × Invited × *T*	–21,823.2**	–28,373.9***
	(–2.27)	(–3.21)
WTC × Invited × *T*	502.7	–3,274.0
	(0.03)	(–0.14)
WTC × Female × Invited × *T*	12,144.4	18,938.8
	(0.55)	(0.75)
R-squared	0.300	0.174

Notes: The number of observations is 204 and the number of enterprises is 102. Numbers in parentheses are *t*-statistics. ***Significant at 1% level, **at 5% level, and *at 10% level. The dependent variables are in TSH 1,000.

benefited from knowledge spillovers, their male counterparts did not. Next, the significant coefficients on Invite × *T* indicate that the treated male entrepreneurs had significantly higher scores than the untreated male entrepreneurs, whereas the almost offsetting negative coefficients on Female × Invite × *T* indicates that the treated female entrepreneurs did not score higher than their untreated counterparts. Thus, as far as

the record-keeping score and the production- and quality-management score are concerned, the greatest increase in the scores was recorded by the treated male entrepreneurs; the second place was shared by the female-treated and the female-untreated entrepreneurs, who still recorded increases in their scores; and the untreated male entrepreneurs did not increase their scores. The results concerning the marketing score are different in that the untreated male entrepreneurs increased their score, and also in that the difference between the treated and untreated male entrepreneurs was relatively small. The treated and untreated female entrepreneurs, however, share almost the same averages of the marketing score, as is the case with the record-keeping score and the production- and quality-management score.

Thus, the treated female entrepreneurs did not increase their management-practice score as much as their treated male entrepreneurs did. A possible explanation is that during the training period, they might have found it more difficult to focus on the training than their male counterparts if females had to contribute more to household production than males, as is the case in the UK and other developed countries according to Bond and Sales (2001) and many other studies. Another explanation may be that female entrepreneurs are less interested in making profits and making their businesses grow than male entrepreneurs because their interest lies in personal fulfillment and autonomy, according to Morris et al. (2006), even though Klapper and Parker (2011) find that such a gender difference in business objective is statistically insignificant.

There is another argument that female and male entrepreneurs differ in motivation when they socialize with other entrepreneurs (e.g., Buttner, 1993; Buttner and Moore, 1997; Shaw et al., 2009). Specifically, Campbell and Lee (1990) and Reevy and Maslach (2001) argue that when socializing with fellow entrepreneurs, females tend to seek emotional support from their social networks but males seek profit opportunities. Empirical studies by Jenssen and Greve (2002) and others find that affective communications are not conducive to business growth.

The results shown in Panel B of Table 8.17 are consistent with this argument: the treated male entrepreneurs talked to other participants to deepen their understanding or to get ideas about how to put into practice the knowledge that they learned from the training programs; they try to prevent the knowledge from spilling over to non-participants, even though the marketing knowledge, if put into practice, gets revealed easily. The treated females talked to a number of non-participants as well as other participants but do not learn much from their conversations with other participants.

Table 8.17 presents the ITT effects on annual revenue and value added, which are estimated by using the 2009 (before the training) and 2011 (after the training) data. Panels A and B of this table correspond to those of Table 8.16, and they share similar patterns even though the significance level is lower in Table 8.17, probably reflecting noise in the revenue and cost data, that is, while the treated males perform better than others, the treated and untreated female entrepreneurs share about the same performance levels, and the untreated male entrepreneurs did not benefit from the training programs at all.

8.4 Conclusions

In Tanzania, the participants in our training programs have frequent contacts with their fellow entrepreneurs. Hence, the knowledge that they learned during the training likely spilt over to the non-participants. In this chapter, we examined the way in which management knowledge taught in a training program spills over. A major finding is that non-participants who talked to a greater number of participants about the training tended to improve their management-practices score and business performance more substantially. By contrast, the number of participants with whom a non-participant was acquainted and the number of participants who were in his or her neighborhood did not matter to the improvement of management practices or business performance. Thus, knowledge spillover is likely to take place when the non-participants talk about the training, not when they merely observe the workshops of the participants. If knowledge spillover is a result of actions taken openly, not in secret, it should be possible to trace knowledge spillover. As we saw, it is easy to count the number of persons with whom one has talked to about the training.

Another major finding is that the participants whose management practices and business performance improved more than others were those who talked to a number of other participants about the training. By contrast, those participants who talked to few participants had as little improvement as those non-participants who did not talk to participants. Probably such participants did not understand the training contents or found the training useless.

Thus, participants who find the training contents useful will discuss among themselves how they can put the knowledge into action, and, if asked by non-participants, they will leak information on the training and application openly. A successful training program will generate animated discussions among participants, reinforcing the advantage of participants

over non-participants, but it will also generate conversations between participants and non-participants, benefiting the non-participants.

An implication of these findings is that measuring such discussions will help gauge training effects in the presence of rampant knowledge spillover. It is well-known that if knowledge spillover is extensive, the estimate of the average treatment effect on the treated is biased downward even in an RCT because not just the treatment group but also the untreated enterprises are affected favorably by the treatment. In other words, the untreated enterprises do not serve as a control group.

For the untreated enterprises to serve as a control group, they should not be affected by the training, and they should operate in the same environments, that is, they and the treated enterprises should sell products in the same product market, purchase inputs in the same input market, and participate in the same labor market. If one uses for comparison those enterprises located very far from the treatment group that knowledge spillovers cannot reach them, they are unlikely to be in the same markets as the treatment group. If untreated enterprises within the same markets are to be used as a control group, we should compare the outcome of the treated entrepreneurs with the outcome of the untreated ones after subtracting the impacts of knowledge spillovers on the latter.

To estimate the impacts of knowledge spillovers on the untreated entrepreneurs, one has to consider the correlation between their conversations with the treated entrepreneurs and their ability as entrepreneurs. The correlation is likely to be positive, that is, more capable entrepreneurs are likely to talk to a greater number of treated entrepreneurs to elicit information about the training. The regression analysis conducted in the first half of this chapter (see Tables 8.3–8.8) did not take this correlation into account, and hence the coefficients on the number of talks are likely to be overestimated. This consideration led us to collect data on the risk attitude, patience, willingness to compete, and business objectives of the entrepreneurs in the third follow-up survey, so that we could control the effects of the otherwise unobservable innate entrepreneurial abilities in the estimation of the impact of knowledge spillover.

In the second half of this chapter, we focused on the issue of female underperformance. Unlike many existing studies, this study of Tanzanian garment enterprises finds that females operate as large and as profitable enterprises as males do, and it does not find significant differences in risk attitude, patience, and willingness to compete. Our interview materials suggest that female entrepreneurs put less emphasis on making profits as a business objective. Yet they had higher management-practice scores

than and about the same business performance as male entrepreneurs before our training programs were implemented. This is probably because the vast majority of them received business training before they started their businesses whereas only a few male entrepreneurs did so.

Another interesting finding is that the female training participants improved their management practices and business performance less than the male participants did. This result, which may be termed female underperformance in learning about management, is consistent with the results of some existing studies of management training experiments. The female underperformance in learning may be a reflection of the fact that the female entrepreneurs had received business training and had higher management-practice scores, that is, it may be interpreted as the male participants' catch-up. Consistent with some existing studies of business psychology, our data suggest that the female participants more easily leaked the knowledge they learned in the training to non-participants and were less keen to learn from other participants. Thus, there may be some differences between female and male entrepreneurs in their way and purpose of communications, which may in turn give rise to female underperformance in learning about management.

In general, knowledge spillover is a major mode of diffusion of new knowledge and drives a wedge between social and private benefits from creating and absorbing new knowledge, thereby calling for public assistance. The results of the analyses conducted in this chapter warrant considerable further studies of knowledge spillover.

9

Self-Selection into Management Training Participation in the Garment Industry in Addis Ababa, Ethiopia

9.1 Introduction

In the garment cluster in Addis Ababa, Ethiopia, a large number of self-employed tailors and a small number of ready-made garment (RMG) factories coexist, as we described in our previous study (Sonobe and Otsuka, 2011, Chapter 9). The enterprise data that we collected for the previous study in 2007 were used as baseline data for the present study of management training. In 2008, the Addis Ababa office of the Japan International Cooperation Agency (JICA) agreed with our idea to provide a short-term training program for the owners or managers of garment enterprises in Addis Ababa for research purposes. We convinced JICA of the advantage of using our baseline sample and the importance of randomizing the assignment of the sample enterprises to a treatment group and a control group.

When the training plan was announced, however, the vast majority of the sample enterprises showed no sign of interest in it. The planned randomization collapsed, and we allowed all interested enterprises to participate in the training program. Although we initially thought of this turn of events as unfortunate, it actually provided us with a good opportunity to observe the interesting outcome of self-selection of individual sample entrepreneurs into training participation. In hindsight, moreover, the indifference of the vast majority of the sample entrepreneurs to the training program could have been expected because the market demand for their garment products was growing rapidly due to the booming economy and because they did not know that management training could help them profit more.

Aside from the lack of randomization, this training program differs in two respects from the programs that we have assessed and discussed in

the previous chapters. First, this program was offered by three Japanese experts in English with simultaneous translation into Amharic, the local language, whereas the other programs were given by local consultants in the local language, with or without being supported by Japanese experts. Second, this program consisted of classroom lectures without the accompanying on-site training, and the lectures tended to lack explanations of how to introduce *Kaizen* to the workers of the training participants compared with the other classroom training programs. Probably the coexistence of self-employed tailors and large factory managers made it difficult for the Japanese instructors to determine what examples to be used to illustrate the concepts of *Kaizen*.

The purpose of this chapter is twofold. First, this chapter extends the analysis of self-selection conducted in Chapter 5. Our baseline and follow-up data indicate clearly that those enterprises in growing segments of the garment market chose not to participate in the training program and those in stagnant segments chose to participate in it. Such self-selection arising from different growth outlooks was not observed in Chapter 5, but it does not seem to be a rare occurrence. This chapter demonstrates how clearly self-selection can separate enterprises into two groups with different growth outlooks.

Second, this chapter highlights the association between the education of entrepreneurs, on the one hand, and the baseline management-practice score, self-selection into training participation, and the impact of the training on management practices, on the other hand. We find that highly educated tailors tend to have higher baseline management scores and are more likely to participate in the training program, and that such educated participants improved management practices more than the other participants did.

We find that the overall impacts of this training program on management practices were weak relative to those of the other training programs discussed in the previous chapters. Presumably, this is attributable to the coexistence of self-employed tailors and large factory managers in the class, the relatively poor communication between the trainers and the participants, and the lack of on-site training. Some *Kaizen* experts with whom we discussed this issue, however, pointed out another possibility that management training, not particularly *Kaizen*, provided for micro enterprises is less effective than that for larger enterprises because micro enterprises have less room for application of new knowledge. This point is consistent with the one made by McKenzie and Woodruff (2012) based on their survey of management training studies conducted in developing countries.

The rest of this chapter is organized as follows. Section 9.2 explains how the baseline and follow-up surveys and the training program were conducted. Section 9.3 presents the results of the analysis of self-selection. Section 9.4 reports the results of the analysis of the heterogeneous effects of the training on management practices. Section 9.5 summarizes the findings and discusses their implications.

9.2 Surveys and training program

9.2.1 Tailors and RMG enterprises

Addis Ababa is a cluster of garment enterprises. Tailor shops are concentrated especially in a few commercial areas. They have inventories of rolls of cloth and make Western-style dresses and suits for individual customers. Another major type of garment enterprise in the city is RMG factories producing suits, sportswear, and other garments. As described in Sonobe and Otsuka (2011, Chapter 9), we enumerated all the tailors and RMG enterprises in Addis Ababa in June 2007 and conducted a sample survey of randomly selected enterprises in collaboration with the Ethiopian Development Research Institute (EDRI). The collected data were used as the baseline for the present study.

The tailors in our sample have shops located on roads for both retailing and production, and they are not hiding themselves from the city authority. Thus, our sample excludes informal enterprises, self-employed sewers providing repair services only, and enterprises working as subcontractors for merchants. The RMG enterprises in our sample are producers with factories. We excluded garment enterprises specializing in traditional Ethiopian costumes. As a result of the enumeration and classification, we found that 667 tailors and 35 RMG enterprises satisfy these conditions. Detailed data were collected from 138 randomly selected tailors and all the 35 RMG enterprises. Thus, the baseline data have a total of 173 sample enterprises.

Of the 35 RMG enterprises, 14 enterprises, including some former state-owned enterprises, were exporting or attempting to export garment products to developed countries. These export-oriented enterprises were provided favorable treatment by the government, such as easy access to low-interest loans and subsidized land use in an industrial area. Although these export-oriented RMG enterprises were distinct from the tailors, the 21 non-export oriented RMG enterprises had something in common with the tailors. For example, the non-export oriented RMG enterprises produced both ready-made and tailor-made garments and had retail shops in shopping areas where tailor shops were

clustered. Moreover, seven non-exporting RMG entrepreneurs started their careers as tailors. One of these entrepreneurs is the founding owner and general manager of the largest and most rapidly growing garment enterprise in the country.

9.2.2 Training program and follow-up survey

In October 2008, the Addis Ababa office of JICA invited the owners or managers of the 173 sample garment enterprises to a sensitization or introductory workshop to let them know that JICA was going to provide a management training program free of charge. JICA was also to inform them that only 40 to 50 owners or managers would be admitted to the program after random selection because the program was being provided for research purposes. We did not propose that the tailors and RMG entrepreneurs take training courses separately because we knew that the budget was not sufficient to offer two courses. Still we were concerned about the difficulty in teaching both junior high school-educated tailors and college-educated RMG managers in the same class. Our priority was to train RMG enterprises for two reasons. First, very small enterprises, at which every production activity and transaction takes place in front of the entrepreneur, might not need *Kaizen* management training as much as RMG enterprises. Second, export-oriented RMG enterprises had performed very poorly when we measured the business performance of the RMG enterprises in our previous study (Sonobe and Otsuka, 2011, Chapter 9), and we hoped that training participation would boost their performance. Thus, we originally planned to assign 20 or 25 RMG enterprises to treatment while randomizing the remaining 10 to 15 RMG enterprises, and to assign 20 to 25 tailors that exceeded a certain threshold size of employment to treatment while randomizing the rest of the tailors meeting this condition.

To our disappointment, however, only 50 entrepreneurs attended the workshop, and not all of them were willing to participate in the training program even after the Japanese ambassador and the state minister of industry and trade made speeches to encourage them to receive the training. Such indifference to management training is in stark contrast to the strong interest shown by the entrepreneurs in the metalwork cluster in Kumasi, Ghana, as described in Chapter 5. We had to give up randomization and allow every entrepreneur or manager interested in the program to participate in it. Still the number of training participants was as small as 39, of which 10 were RMG entrepreneurs and 29 were tailors, as shown in the first row of Table 9.1.

Table 9.1 Sample size and characteristics of the enterprises and entrepreneurs by treatment status and enterprise type in the garment cluster in Addis Ababa

	Both types		RMG enterprises		Tailors	
	Participants	Non-participants	Participants	Non-participants	Participants	Non-participants
	(1)	(2)	(3)	(4)	(5)	(6)
Number of observations	39	112	10	25	29	87
Years of schooling	12.8	10.5***	15.5	15.1	11.9	9.2***
Age of the entrepreneur	41.4	43.8	44.1	49.8	40.4	42.1
Years of prior experience in garment business	2.4	2.2	1.5	2.2	2.7	2.2
Father received formal education (yes = 1)	0.38	0.31	0.50	0.68	0.34	0.21
Prior training experience (yes = 1)	0.38	0.24*	0.60	0.56	0.31	0.15*
Entrepreneur is the founder (yes = 1)	0.92	0.73*	0.90	0.56*	0.93	0.78*
Prior factory experience (yes = 1)	0.20	0.13	0.60	0.24*	0.07	0.09
Located in Addis Ketma (yes = 1)	0.21	0.27	0.10	0.16	0.24	0.30
Located in Arada (yes = 1)	0.19	0.19	0	0.04	0.28	0.23
Located in Nifas Silk (yes = 1)	0.08	0.08	0.10	0.36	0	0

Notes: Asterisks * and *** indicate that the difference in the mean between the participants and the non-participants of the indicated enterprise type is statistically significant at 10% and 1% levels, respectively.

Sources: Own surveys.

The training program was designed similarly to those in Ghana (Chapter 3) and Kenya (Chapter 5). The training relied on classroom lectures, which were problem-centered and participatory with various demonstrations such as case studies and visual aids. The training contents were divided into three modules: an introduction to entrepreneurship, business planning and marketing; an introduction to production management; and an introduction to financial management.

The major difference of this training program from the other programs discussed in this volume is that the three modules were prepared and taught in English by three Japanese experts dispatched by JICA and translated by a local interpreter into Amharic. Because of the translation, trainers and trainees sometimes had difficulty in making themselves understood quickly. The program was offered for 24 weekdays (or almost five weeks) in November and December 2008, each session lasting 2.5 hours from 5:30 p.m., so that the entrepreneurs' opportunity cost of attending the training would be kept at a minimum. This training program had a longer period than the other classroom training programs because of the communication difficulty. Still the average attendance rate was as high as 85 percent or 20.4 sessions out of the 24 sessions offered. Every trainee attended more than two-thirds (16 sessions) of the 24 sessions and, thus, is regarded as a participant. The high attendance rate suggests that the participants were not disappointed with the program.

Compared with the training program in Ghana (Chapter 3) and Kenya (Chapter 5), this program in Ethiopia seemed more informative because rich knowledge was available from the Japanese experts, but it suffered from the difficulty in communication. Having learned from this experience, we decided to assign local consultants to the role of lecturer and moderator for the lectures and classroom discussion and a Japanese expert to the role of coach for the local consultants in the subsequent training programs in Ethiopia (Chapter 4), Vietnam (Chapter 7), and Tanzania (Chapter 8).

A follow-up survey of the 173 sample enterprises was conducted a year later in October 2009, but data were collected only from 151 enterprises, of which 116 were tailors and 35 were RMG factories. Attrition in the sample occurred to 22 tailors, of which six tailors could not be traced and 16 were retired, engaged in other businesses in different locations, or employed by others. These 22 enterprises with attrition cases are all non-participants, whereas there was no attrition among the training participants. In all the tables shown below, we report only the results of the descriptive and regression analyses that used the sample of the 151

enterprises. The larger sample of the 173 enterprises could be used in the analysis of the participation, but the results are not qualitatively different from the ones shown in Table 9.4 below.

9.2.3 Characteristics of the entrepreneurs

Table 9.1 presents the basic characteristics of the sample by enterprise type and by participation status. Columns (1) and (2) summarize the data of the participants and the non-participants, respectively, including both the RMG enterprises and the tailors. Reflecting on self-selection, participants and non-participants differ significantly in schooling, experience of participating in a business or vocational training program prior to the *Kaizen* training under study, and in terms of whether the entrepreneur is a founder of the current business.

Columns (3) and (4) present the data of the RMG participants and the RMG non-participants, respectively. The average number of years of schooling is 15.2, which is comparable with the educational level of entrepreneurs in the export-oriented cut-flower industry, the most dynamically growing industry in Ethiopia, in which many entrepreneurs are foreigners (Mano et al., 2011). It is also comparable with or higher than the average educational level in world-class garment clusters, such as Dhaka, Bangladesh, where the average number of years of education was 15.0 (Sonobe and Otsuka, 2011, Chapter 8) and Zhili (or Jili), China, where it was only 7.5 years (Sonobe and Otsuka, 2006, Chapter 6). Because some factories were operated by hired managers, the fraction of RMG founders was lower than its tailor counterpart.

The qualitative results of the *t*-test on the difference in means shown in columns (5) and (6), which show the data for the tailors, are the same as those in columns (1) and (2), because the tailors constitute a majority of the whole sample. Those tailors with higher education and those who had participated in a training program before our training program were more likely to participate in our program, suggesting that education and training experience increase the value that entrepreneurs attach to training. Among the tailors, those who were not founders were more likely to participate in the training program.

The sample enterprises are geographically concentrated in three sub-cities called Addis Ketma, Arada, and Nifas Silk of the ten sub-cities in Addis Ababa. Addis Ketma, otherwise known as Marcato, is the largest commercial area in the country and had 33 tailors in our sample. Another commercial area, Arada, had 27 tailors in our sample. In these two sub-cities, a majority of the RMG enterprises had retail shops. Nifas Silk is an industrial area and home to ten RMG factories, but none of the tailors in our sample are located here.

9.3 Self-selection into training participation

9.3.1 Market segments and self-selection

Table 9.2 presents the data on real sales revenue, real value added, and some other variables, which can be considered to measure some aspects of business performance.[1] Value added is defined here as sales revenue minus material cost, electricity cost, and subcontracting cost. Columns (1) and (3) show the baseline data of the RMG participants and non-participants, respectively. In terms of sales revenue and value added, the RMG non-participants are four times larger than the RMG participants are. In terms of the size of workforce, the non-participants are ten times as large as the participants are. Such a difference in size must be a result of self-selection into training participation.

The small factories in our RMG sample catered to the high-end market for men's suits in the capital city. They employed highly skilled sewers, each of whom used more than one machine to produce high-quality suits and, hence, they had a high wage share, high value added per worker, and high labor cost per worker, relative to the large factories. Many of the large factories employed a number of unskilled workers and produced sports shirts and t-shirts for mass markets in and outside the country. The two largest enterprises were owned and operated by former tailors, and their main products were ready-made suits. Unlike the small factories producing suits, however, they were characterized by mass production and mass selling, together with their TV commercials and established brand names.

Why did the small factories tend to choose to participate in the training program and why did the larger factories choose not to participate in it? In Chapter 5, we found that a major determinant of training participation was the time cost of participating in the training program, and that the entrepreneurs operating smaller enterprises were more likely to participate in the training program than those operating larger enterprises. The time cost was important there because the post-election violence in the neighborhood of the study site forced us to hold the training program in the daytime when entrepreneurs of thriving enterprises were busy. By contrast, the training program for the garment producers in Addis Ababa was held in the evening, and we did not require the attendance of the top manager but allowed any manager to represent each participating enterprise. Thus, the time cost should be less relevant to this case.

Presumably, more relevant is the differential growth outlook. In Nairobi, the participants and non-participants shared almost the same mixture of product and service types, and the average sales revenue of

Table 9.2 Sample size and account-based performance by treatment status and enterprise type in the garment cluster in Addis Ababa (ETB1,000, annual)

	RMG enterprises				Tailors			
	Participants		Non-participants		Participants		Non-participants	
	Before	After	Before	After	Before	After	Before	After
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Sales	728.0	669.1	2,949.0	4,251.5	50.1	69.2	22.1	36.2
Value added	361.0	338.6	1,387.0	2,000.1	32.2	38.0	12.7	22.3
Labor cost	150.9	117.5	403.2	634.1	11.8	12.3	3.6	5.0
Gross profit	210.1	221.1	983.8	1,366.0	20.4	25.7	9.1	17.3
Number of workers	26.5	18.3	283.1	226.8	4.5	5.0	3.3	3.6
Number of sewing machines	32.8	29.0	167.2	178.6	2.62	3.69	2.09	2.48
Wage share (%)	41.8	34.7	29.1	31.7	36.6	32.4	28.1	22.4
Value added per worker	13.6	18.3	4.90	8.82	7.17	7.62	3.80	6.25
Labor cost per worker	5.69	6.35	1.42	2.80	2.62	2.46	1.07	1.40

Sources: Own surveys.

the participants increased much more than that of the non-participants as shown in columns (1) and (2) of Table 5.4. In Addis Ababa, the demand for garments grew during the period of the 2.5 years between the baseline and follow-up surveys due to the booming economy and increasing population. The average sales revenue of the non-participants increased by more than 40 percent as shown in columns (4) of Table 9.2, but that of the participants decreased by 8 percent as shown in column (2). It appears that the small factories decided to participate in the training program because their ready-made suit market was being taken over by the largest enterprises with established brand names, while these largest enterprises and the factories producing sports shirts and t-shirts decided not to participate because they expected high growth of their markets. Presumably, the latter would not think that they could grow even larger by learning about *Kaizen*. This is not surprising because they were not yet acquainted with *Kaizen*.

According to column (2) of Table 9.2, the RMG participants reduced their number of workers and labor cost by 30 percent and 22 percent, respectively, which led to a slight increase in profit, or value added minus labor cost. In general, *Kaizen* improves productivity by changing the attitudes of personnel toward work, not by cutting down on personnel. Thus, the slight increase in profit of the RMG participants cannot be taken as a favorable impact of the *Kaizen* training program. Therefore, why did they cut personnel by as much as 30 percent when the sales revenue declined only by 8 percent? It is possible that they thought they had excessively large employment as reflected in their relatively high wage share. The idea of excessive employment, if they had it, would have come from a business management strategy called business process reengineering (BPR), which the Ethiopian government was recommending enterprises to adopt in those days.[1] Among the garment enterprises, probably the export-oriented RMG enterprises were the first to adopt BPR because they were receiving favorable treatment from the government. As shown in column (4), the average number of workers at the non-participants' enterprises was reduced by 20 percent despite the 40 percent growth in sales revenue.

Turning to the tailors, the participants and non-participants did not differ clearly in terms of the garment items that they produced, or the services that they provided to customers, or their location. Thus, they were considered to be in the same market. Nonetheless, as shown in columns (5) to (8), the participants grew much less rapidly than the non-participants in terms of sales revenue, value added, and profit. A possible explanation why the participants could not keep pace with

the growing demand for garments is that they found it difficult to expand the size of their operation in the limited space in their shops located in congested commercial areas. As we saw in Table 9.1, the participants and their parents went to school for longer periods, suggesting that their families tended to be more affluent. Indeed, they had greater operation sizes than the non-participants as shown in Table 9.2. They would employ a few skilled sewers as well as chore boys, and they might work as a sewer or operate other businesses. Compared with these tailors, the non-participants were more genuinely self-employed and likely to be the only skilled sewer at their shops. They continued to sew even after their average sales revenues increased by more than 60 percent, and this is why the average number of workers at their shops increased only by 0.5 person. In other words, before the demand increased, they were considerably idle, and presumably, they were immune to the congestion problem that constrained the participants.

9.3.2 Baseline management skills and self-selection

The management skills that the entrepreneurs may already have before the training program and the expectation that they had as to the impact of the program on their management skills would be important factors determining whether they would participate in the program or not. To measure management skills, our baseline and follow-up surveys asked 23 questions, consisting of six questions related to marketing and workshop housekeeping practices, 16 questions related to record keeping,[2] and one question about planning based on records. We refer to the number of positive answers to these questions as the management-practice score or management score.

The scores of the sample enterprises before and after the training program are shown in Table 9.3 by treatment status. The RMG enterprises had much higher scores in marketing and housekeeping practices and in record-keeping practices than the tailors. Besides such differences between the RMG enterprises and the tailors, there are a few interesting observations drawn from this table. First, among the RMG enterprises, the participants had lower scores on these practices than the non-participants. In terms of the marketing and housekeeping rating, the participants scored significantly below the non-participants at the baseline survey, but the former caught up with the latter at the follow-up survey, indicating that there was a favorable impact of the training. In terms of the record-keeping score, however, there was no catch-up, suggesting that whether or not to keep records is a matter of habit rather than knowledge for educated people.

Table 9.3 Management score by treatment status and enterprise type in the garment cluster in Addis Ababa

	RMG enterprises				Tailors			
	Participants		Non-participants		Participants		Non-participants	
	Before	After	Before	After	Before	After	Before	After
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Marketing and housekeeping score (max = 6)	3.10	4.80	4.28	4.80	1.14	1.79	0.45	0.59
Record-keeping score (max = 16)	12.4	12.6	14.4	14.4	7.79	8.55	6.46	6.61
Planning based on records (max = 1)	0.49	0.52	0.47	0.47	0.51	0.55	0.37	0.37

Sources: Own surveys.

Among the tailors, the participants had higher scores of marketing and housekeeping practices and record-keeping practices than the non-participants, contrary to the RMG case. In both sets of practices, the participants improved their scores after the training program more than the non-participants did, indicating that there were positive impacts of the training. Although the tailor participants had much lower scores on marketing and housekeeping practices than the RMG participants, the former improved this score only by 0.65 (= 1.79 – 1.14), which was much smaller than the increase of 1.70 (= 4.80 – 3.10) that the RMG participants recorded. These observations are consistent with the view shared by not a few business consultants that management training is less effective for micro enterprises than for larger enterprises. Although this view may appear not to apply to the record-keeping score, which the RMG participants did not improve at all, this may be attributed to the fact that the RMG participants were much more educated than the tailor participants as shown in Table 9.1.

Table 9.4 presents the results of regressions linking the educational and occupational backgrounds and other characteristics of the entrepreneurs and enterprises with their management scores at the baseline survey. Columns (1) and (4) report the estimated Tobit models explaining the market and housekeeping score of the RMG enterprises and the tailors, respectively, at the baseline survey. The Tobit specification is used because

Table 9.4 Association between the entrepreneurs' characteristics and baseline management scores in the garment cluster in Addis Ababa

	RMG enterprises			Tailors		
	Marketing and housekeeping	Record keeping	Planning	Marketing and housekeeping	Record keeping	Planning
	(1)	(2)	(3)	(4)	(5)	(6)
Years of schooling	–0.01	0.45**	0.15	0.28***	0.43***	0.11**
	(0.09)	(0.20)	(0.15)	(0.07)	(0.16)	(0.05)
Age of the entrepreneur	0.05	0.25***	0.12*	0.00	–0.07	–0.01
	(0.03)	(0.07)	(0.07)	(0.02)	(0.06)	(0.02)
Years of prior experience in garment business	–0.17**	–0.31*	–0.16	0.11*	0.12	–0.02
	(0.07)	(0.15)	(0.11)	(0.06)	(0.15)	(0.04)
Father' s education	–0.48	0.84	–0.33	0.07	–0.45	–0.22
	(0.61)	(1.29)	(0.91)	(0.44)	(1.15)	(0.32)
Prior training experience	0.03	1.60	–1.73	0.72	0.08	0.60*
	(0.52)	(1.16)	(1.08)	(0.45)	(1.17)	(0.33)
Founder	–0.92	–1.61	–1.68	0.30	2.37*	0.20
	(0.58)	(1.33)	(1.06)	(0.54)	(1.40)	(0.39)
Prior factory experience	1.24*	2.37	0.00	0.48	–0.24	0.49
	(0.69)	(1.50)	(0.98)	(0.67)	(1.80)	(0.51)

(*Continued*)

Table 9.4 (*Continued*)

	RMG enterprises			Tailors		
	Marketing and housekeeping	**Record keeping**	**Planning**	**Marketing and housekeeping**	**Record keeping**	**Planning**
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Addis Ketma	–0.27	7.16***	1.08	–0.67	1.12	0.80**
	(0.89)	(2.13)	(1.59)	(0.49)	(1.21)	(0.33)
Arada	–1.07	4.56		–0.17	–0.32	–0.26
	(1.48)	(3.44)		(0.48)	(1.20)	(0.36)
Nifas Silk	1.21*	0.76	–1.08			
	(0.60)	(1.25)	(0.88)			
Constant	3.57	–6.78	–4.10	–3.19**	2.96	–1.36
	(2.41)	(5.82)	(4.74)	(1.29)	(3.22)	(0.91)
Observations	35	35	34	116	116	116
Right censored	13	7		2	1	
Left censored	0	1		56	19	

Notes: Columns (1), (2), (4), and (5) report estimated Tobit models while columns (3) and (6) report estimated probit models. Numbers in parentheses are SEs. ***, **, and * indicate significance at 1%, 5%, and 10% levels, respectively.

some enterprises scored zero or full marks as shown toward the bottom of the table. Columns (2) and (5) report the estimated Tobit models of the record-keeping score, while columns (3) and (6) report the estimated probit model of the planning score, as this score is either 0 or 1.

Only a few variables are closely associated with the baseline management scores of the RMG enterprises. The education and the age of entrepreneurs are closely associated with the record-keeping score but not with the marketing and housekeeping score. The dummy variable indicating whether the entrepreneur had experience in the garment business prior to the current business is negatively and significantly associated with these two scores. Note that the location in Addis Ketma, a busy commercial area, is not a cause of high scores, but it is likely to be an effect of meticulous record keeping. Similarly, the age variable is likely to be an effect to the extent that it is closely associated with enterprise age. Older RMG entrepreneurs, especially those who used to be tailors, were not highly educated, but they had high record-keeping scores. They had survived competition for many years probably because of their habit of keeping records meticulously. Younger RMG entrepreneurs tended to be highly educated and tended to have high scores on record keeping.

In the sample of tailors, education is closely associated with the three management scores than in the sample of RMG enterprises. Moreover, education is the only variable that has highly significant coefficients, except for the Addis Ketma dummy in column (6). Many studies of MSEs, such as McPherson (1996), Ramachandran and Shah (1999), Mengistae (2001) to name a few and our previous studies (Sonobe and Otsuka, 2006, 2011), in SSA and Asia, find that enterprise size and growth are correlated with the educational level of entrepreneurs. Because these studies do not measure management practices, they just interpret this common finding as indicating that business performance and education are associated because better-educated entrepreneurs tend to be better managers. Another possible interpretation is that better-educated entrepreneurs tend to have better access to finance because they tend to be from affluent families. The examination of the relative importance of these two interpretations is important but just recently pioneered by Giné and Mansuri (2011). Our results offer evidence for the association between education and management skills but no evidence regarding its relative importance.

The bottom part of the table shows that nearly half of the tailors in the sample scored zero on marketing and housekeeping practices, and

that 19 tailors scored zero on record-keeping practices which means that they kept no records about payment, receipts, input, output, inventory, lending, and borrowing. This finding shows that it is wrong to assume that if entrepreneurs operate businesses, then they must also be capable of management. Years of business operations and having survived competition are likewise not sufficient factors to confirm management capability.

9.3.3 Probit model of self-selection into training participation

Table 9.5 presents the estimates of the probit model explaining the association between self-selection into training participation and the variables representing the characteristics of entrepreneurs and their enterprises, including the baseline enterprise size measured by the number of sewing machines and the three baseline management-practice scores. This specification, however, did not work on the RMG enterprise sample. Many of the estimated coefficients had extraordinarily large standard errors (SEs). This problem occurred if the three baseline scores and the number of sewing machines were replaced by the total score and the number of workers, respectively. If the management scores or the enterprise size variable were excluded from the model, the problem disappeared, but no estimated coefficients were significant as shown in column (1). Thus, the small size of the RMG sample prevented us from gaining more insight into the self-selection of the RMG enterprises than what we discussed in the previous sub-sections.

The estimated probit models of the training participation of tailors are shown in columns (2) and (3). The years of schooling and the founder dummy have positive and significant coefficients. These results indicate that entrepreneurs with relatively high education and founding entrepreneurs were more willing to learn about management. Since better-educated entrepreneurs and founding entrepreneurs had higher baseline management scores as we saw in Table 9.4, the coefficients on schooling and the founder dummy become smaller when the baseline scores are inserted.

A major finding from Table 9.5 is that the management score has a significant coefficient even if the effect of schooling on participation is controlled. It follows that entrepreneurs with higher baseline management scores were more likely to participate in the training program. In other words, those who needed to learn about management were not willing to participate in the training program. This finding points to the importance of increasing the awareness on the usefulness of management training.

Table 9.5 Estimated probit model of self-selection into participation in the garment cluster in Addis Ababa

	RMG enterprises	Tailors	
	(1)	(2)	(3)
Years of schooling	0.29	0.17***	0.13***
	(0.27)	(0.06)	(0.06)
Age of the entrepreneur	–0.02	0.01	0.01
	(0.05)	(0.02)	(0.02)
Years of prior experience in garment business	–0.11	–0.01	–0.03
	(0.25)	(0.05)	(0.06)
Father's education	–1.11	0.54	0.46
	(1.43)	(0.35)	(0.36)
Prior training experience	–0.34	0.49	0.27
	(1.07)	(0.35)	(0.38)
Founder	2.47	1.24**	1.17**
	(2.15)	(0.50)	(0.51)
Prior factory experience	–0.26	–0.41	–0.46
	(1.42)	(0.60)	(0.64)
Number of sewing machines	–0.02	0.05	–0.02
	(0.02)	(0.08)	(0.10)
Marketing and housekeeping score			0.42**
			(0.17)
Record-keeping score			–0.04
			(0.04)
Planning based on record score			0.14
			(0.35)
Constant	–5.00	–4.01***	–3.33***
	(9.47)	(1.27)	(1.30)
Number of observations	35	116	116

Notes: Numbers in parentheses are SEs. ***, **, and * indicate significance at 1%, 5%, and 10% levels, respectively.

9.4 Combined impacts of training and self-selection on management practices

This section presents the results of the estimation of training impacts even though they suffer from the problem of self-selection bias. As we discussed in the previous section, since the market growth outlook was one of the major determinants of training participation, the selection bias should pose a severe problem particularly to the estimation of training impacts on business performance, such as sales revenues and profits. We employed the fixed-effects (FE) model, the DID-PSM estimator, and

Table 9.6 Estimates of the combined effects of the training and self-selection in the garment cluster in Addis Ababa

	Marketing and housekeeping	Record keeping	Planning	Sales (10^3 ETB)	Value added (10^3 ETB)	Gross profit (10^3 ETB)
	(1)	(2)	(3)	(4)	(5)	(6)
Both types						
(1) Participant dummy×Year *2009*	0.70***	0.49*	0.03*	–110.4	–62.2	–39.5
dummy in the FE model	(0.15)	(0.29)	(0.015)	(358.3)	(118.4)	(90.1)
Number of observations	302	302	302	453	453	453
(2) DID-PSM	0.38*	0.59*	0.17	754.4	151.0	167.1
Number of observations	(0.21)	(0.35)	(0.21)	(476.8)	(219.0)	(269.1)
	151	151	151	151	151	151
(3) DID-BCM	0.67***	0.54	0.03	113.0	–42.8	16.9
Number of observations	(0.19)	(0.36)	(0.02)	(634.6)	(193.7)	(173.1)
	151	151	151	151	151	151
Tailors						
(1) Participant dummy×Year 2009	0.52***	0.61*	0.04*	0.38	–2.48	–2.28
dummy in the FE model	(0.15)	(0.37)	(0.02)	(11.3)	(8.50)	(8.06)
Number of observations	232	232	232	348	348	348
(2) DID-PSM	0.23	0.73	0.32	23.9	3.80	6.12
Number of observations	(0.29)	(0.51)	(0.24)	(24.7)	(11.3)	(13.0)
	116	116	116	116	116	116
(3) DID-BCM	0.47**	0.70	0.03	16.1	–1.77	1.80
Number of observations	(0.21)	(0.48)	(0.03)	(17.6)	(11.7)	(11.0)
	116	116	116	116	116	116

Notes: Numbers in parentheses are SEs. ***, **, and * indicate significance at 1%, 5%, and 10% levels, respectively.

Table 9.7 Fixed-effects model estimates of heterogeneous effects in the garment cluster in Addis Ababa

	Marketing and housekeeping	Record keeping	Planning	Sales (10^3 birr)	Value added (10^3 birr)	Gross profit (10^3 birr)
	(1)	(2)	(3)	(4)	(5)	(6)
Both types						
(1) Years of schooling × Participant × Year 2009	0.12***	0.08	0.00	–7.71	–8.04	–7.47
	(0.04)	(0.07)	(0.00)	(90.96)	(30.04)	(22.86)
(2) Baseline marketing and housekeeping score	0.35***	0.12	0.01	16.12	4.93	1.94
× Participant × Year 2009	(0.06)	(0.12)	(0.01)	(30.39)	(14.76)	(13.50)
(3) Baseline record practice score × Participant	0.01	0.11**	0.01**	3.12	0.46	–0.50
× Year 2009	(0.03)	(0.05)	(0.00)	(12.94)	(6.28)	(5.74)
(4) Baseline planning based on records	0.06	0.69	0.05*	45.47	35.98	35.56
× Participant × Year 2009	(0.26)	(0.49)	(0.03)	(124.58)	(60.41)	(55.24)
Tailors						
(1) Years of schooling × Participant × Year 2009	0.10**	0.18*	0.01	3.06	1.65	1.43
	(0.04)	(0.11)	(0.01)	(3.22)	(2.42)	(2.30)
(2) Baseline marketing and housekeeping	0.51***	0.40**	0.03***	6.53	6.02	5.98
score× Participant × Year 2009	(0.06)	(0.19)	(0.01)	(6.30)	(5.64)	(5.63)
(3) Baseline record practice score × Participant	0.05*	0.21***	0.01***	1.17	1.18	1.03
× Year 2009	(0.03)	(0.07)	(0.00)	(2.53)	(2.27)	(2.26)
(4) Baseline planning based on records	0.77***	0.96	0.06*	3.81	8.99	10.88
× Participant × Year 2009	(0.25)	(0.65)	(0.03)	(21.77)	(19.48)	(19.41)

Notes: The sample size has 302 observations in the upper panel and 232 observations in the lower panel. Numbers in parentheses are SEs. ***, **, and * indicate significance at 1%, 5%, and 10% levels, respectively.

the DID bias corrected matching (DID-BCM) estimator developed by Abadie and Imbens (2002), respectively.[3] The use of the latter two is expected to mitigate the self-selection bias. Because of the self-selection bias, what we report in Tables 9.6 and 9.7 are merely the combined estimates of the training effect and the self-selection effect on the management scores and business performance, but the way in which the estimates vary according to different estimators, samples, and outcome variables seems reasonable and informative.

The first row of Table 9.6 reports the estimate of the combined effect obtained by an application of the following FE model:

$$y_{it} = \beta_0 + \beta_1 P_i \times Year09_t + \beta_2 P_i + \beta_3 Year09_t + u_i + \varepsilon_{it},$$

where p_i is a dummy variable indicating whether entrepreneur i participated in the training program, $Year09_t$ is a dummy variable indicating whether year t was the year 2009, that is, after the training program, u_i is the fixed effect of entrepreneur i, and ε_{it} is an error term.[4] The first row of Table 9.6 reports coefficient β_1, which would measure the training impact if participation status p_i and error term were independent. Actually, the self-selection makes p_i and ε_{it} correlated closely in some cases and less closely in others. Our discussion in Section 9.3.1 implies that they should be closely and negatively correlated in the case in which the outcome variable is sales revenue and the RMG sample is used. Because of the small size of the RMG sample, however, DID-PSM and DID-BCM estimates are unavailable for this sample. Instead, Tables 9.6 and 9.7 report the estimation results obtained from the whole sample, including both RMG enterprises and tailors, and the tailor sample in the upper and lower panels, respectively. In the first row of Table 9.6, the FE estimate of the impact β_1 on sales revenue is negative because of the influence of the RMG sample even though the RMG enterprises are a minority in the whole sample, and the estimated impacts on the other performance variables are also negative for the same reason.

In the upper panel of Table 9.6, the FE estimates of the impacts on the three management scores are positive and significant, and that on the marketing and housekeeping score is highly significant, as shown in columns (1) to (3). While the DID-PSM estimate of the training impact on this score is smaller in magnitude and lower in significance, it is still positive and significant, and its DID-BCM counterpart is as large and highly significant as the FE estimate. Turning to columns (4) to (6), the DID-PSM and DID-BCM estimates of the training impacts on business performance are not significant but generally positive, unlike the FE estimates. This is probably because the use of the PSM and BCM has mitigated the downward self-selection bias.

In the lower panel of Table 9.6, where only the tailor sample is used, the FE estimates of the impacts on the three management scores are still positive and significant, their DID-PSM counterparts are again lower in significance, and the DID-BCM counterparts are as large as the FE estimates. These estimates on the marketing and housekeeping score in the lower panels are smaller in magnitude and lower in significance than the upper panel. The lower significance level may be attributable to the smaller sample size in the lower panel, but the smaller magnitude is consistent with our view that management training for micro enterprises can be less effective than for large enterprises. The estimates of the impact on the record-keeping score are somewhat larger in the lower panel than in the upper panel, but they are not significant. Turning to the estimates of the impacts on business performance shown in the lower panel, the DID-PSM and DID-BCM estimates tend to be larger than the FE estimates. This also seems attributable to the mitigation of the downward bias arising from the self-selection.

We have so far assumed that the participants in each sector would share the same impacts of the training, but the impacts may vary considerably across the participants. To see such heterogeneous effects, we extend the FE model to include another interaction term as follows:

$$y_{it} = \delta X_i \times P_i \times Year09_t + \beta_0 + \beta_1 P_i \times Year09_t + \beta_2 P_i + \beta 3 Year09_t + u_i + \varepsilon_{it},$$

where X_i is a variable representing a trait of entrepreneur i. The combined impact of the training and self-selection is now written $\beta_1 + \beta X_i$. Table 9.7 reports the FE estimates of δ in the case in which X_i is the years of education or one of the three baseline management scores. As in the previous table, the upper and lower panels show the results obtained from the whole sample and from the tailor sample, respectively.

There are no significant estimates in columns (4) to (6) where the business performance indicators are the outcome variable, y_{it}. The results shown in columns (1) to (3) indicate that the combined effect of the training program and self-selection into training participation on the management scores is stronger for those participants who had higher education and higher baseline scores. These tendencies are clearer for the tailor sample than for the whole sample. As we saw in the previous section, those tailors with relatively high education and better management skills were more likely to participate in the training program (see Table 9.5). Here in Table 9.6, we find that even among the participants, those who have relatively high education and better management skills tended to adopt the management practices taught in the

program. If the influence of self-selection into training participation is the same for all the tailor participants regardless of their educational level and baseline management score, these estimates of δ are considered to represent the heterogeneous impacts of the training program. To support this conjecture, we need the DID-PSM and DID-BCM estimates as well, but these estimates that we have so far obtained were sensitive to slight changes in the sample and not as robust as the estimates shown in Tables 9.6 and 9.7.

9.5 Conclusions

This chapter has found that entrepreneurs are more likely to participate in a management training program if their growth prospects are gloomy as well as if they attach higher values to management training relative to their time costs. The chapter has also found that entrepreneurs operating in the same industrial cluster can have considerably different market growth outlooks. The estimation results obtained by the application of different estimators demonstrate how strong the influence of self-selection can be along the line of market growth outlook.

This chapter also confirmed the two most common and important findings of this volume. The first is that those entrepreneurs who need to learn about management do not know the value of learning about management. The second is that entrepreneurs of MSEs in the developing countries know surprisingly little about the management practices which are standard in developed countries, especially at large companies. The very low management scores of the tailors in the sample show that it is wrong to assume that even micro enterprise owners are capable of management simply because they have operated their businesses for years.

This chapter has also found that better-educated entrepreneurs in our sample had higher management-practice scores at the baseline survey, were more likely to participate in the training program, and adopted more management practices taught in the program. Moreover, those who had higher management-practice scores at the baseline survey were more likely to participate in the training program even after controlling for the correlation between education and management skills, and they adopted more management practices taught in the program. Probably, those who had relatively high management scores knew the value of learning about management, and education increases the awareness of its value.

While the estimation results indicate that better-educated entrepreneurs are better managers, we must note that this holds true only in the relative sense. Our data clearly indicate that even highly educated entrepreneurs have substantial room to improve their management practices. As the fact that fast-growing RMG entrepreneurs did not participate in the training program attests to, even highly educated entrepreneurs do not know the real value of management training. The results of this chapter thus warrant policy interventions boosting the awareness of the value of learning management for enterprise growth and industrial development.

Part III

Toward a Strategy for MSE Development

10

New Industrial Development Policy: *Kaizen* Management Training as a Key to Cluster-Based Development

10.1 Introduction

For the last 15 years, we have conducted well over 20 intensive case studies of the development of industrial clusters beginning with Northeast Asia (Japan, Taiwan, and China), moving to one part of East Asia (Vietnam) and South Asia (Bangladesh and Pakistan), and finally proceeding to SSA (Ghana, Ethiopia, Kenya, and Tanzania). Most of these studies are reported in Sonobe and Otsuka (2006, 2011) as well as in this volume. Although we did not conduct intensive surveys, we have also visited and explored the development process of several industrial clusters in the Philippines, India, and Sri Lanka. As was reviewed in Chapter 2, the first major finding of our entire study is the similarity of the process of the formation of industrial clusters across industries, countries, and even continents, which is commonly based on spin-offs. The second major finding was that typically two types of industrial clusters emerge in later stages of cluster development (i.e., dynamic and survival clusters, aside from jump-start clusters). Innovation is the key to the sustained development of cluster-based MSEs in developing countries, which determines the fate of clusters in the longer run. Thirdly, we found that adequate management capacity is indispensable for innovations. Fourthly, we found strong evidence that management capacity can be acquired by work experience, schooling, and, most importantly, training. More specifically, learning from abroad by working for multinational companies, by studying in vocational schools and universities, and by attending training programs abroad or by being taught by instructors familiar with advanced management knowledge is important for enhancing management capacity.

Our findings are consistent with the recent argument of the economic literature that management is a major determinant of business performance (e.g., Bertrand and Schoar, 2003; Bloom and Van Reenen, 2007; Ichniowski et al., 1997), and that management practices can be improved by proper training (e.g., Bjorvatn and Tungodden, 2010; Bloom et al., 2013; Bruhn et al., 2010; Drexler et al., 2014; Field et al., 2010; Karlan and Valdivia, 2011; Mano et al., 2012). Our findings also support the view that the engine of industrial growth and development is innovation, for which management capacity plays an important role.

Thus, the central theme of this volume is to establish the proposition that the key to opening up a new avenue for the dynamic growth of MSEs through innovations lies in the enhancement of the managerial capacity of entrepreneurs. In order to test this proposition, a series of *Kaizen* management training programs were offered in three metalwork clusters in Ghana (Chapter 4), Kenya (Chapter 5), and Ethiopia (Chapter 6), and three garment clusters in Vietnam (Chapter 7), Tanzania (Chapter 8), and Ethiopia (Chapter 9). They are RCTs except for Chapters 5 and 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.[1] Moreover, a metalwork cluster, if developed successfully, can become a so-called "supporting" industry, providing repair services for machinery in a variety of industries and producing parts and components for the machinery industries.

Following the introduction, we provide a summary of the major findings of this volume in Section 10.2. We inquire into the possible reasons for the puzzling observation that management training significantly improves management practices but not necessarily business performance in Section 10.3, whereas we discuss issues for future research on management training in Section 10.4. We broaden our perspectives and propose effective industrial development policies in Section 10.5, and conclude this study in Section 10.6.

10.2 A summary of the major findings

In Part II, which reports the results of our management experiments, we basically 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). In our experiments, in principle, we randomly invited a number of owners and managers of

MSEs to take part in a training program. Randomization, however, was not possible in the metalwork cluster in Nairobi due to the post-election violence and in the garment cluster in Addis Ababa due to the indifference to the management training program as discussed in Chapters 5 and 9. Even if owners and managers were invited to the training randomly, some of the invited decided not to attend the training program. Taking the incidence of such non-compliance into account, we used the LATE estimator developed by Imbens and Angrist (1994) as well as the ITT estimator.

In most clusters, local business consultants provided management training in local languages in a classroom setting. The only exception was the training program in the garment cluster in Addis Ababa (Chapter 9), which was offered by Japanese consultants in English and translated by an interpreter into the local language. In the metalwork cluster in Ethiopia (Chapter 6) and the garment clusters in Vietnam (Chapter 7) and Tanzania (Chapter 8), we also offered on-site training several months after the classroom training was completed. In the on-site training program, instructors visited participants to teach them how to adopt useful management practices. They later visited the enterprises again to check if the assimilation was going well and to give further advice. The assignment to the on-site training was random and independent of the random assignment to the classroom training. In general, we provided three-to-four-week classroom training in all the sites.

A common finding obtained by a number of randomized controlled experiments carried out to test the effectiveness of management training and consulting services provided to MSEs in various parts of the developing world,[2] including our own randomized experiments (Chapters 4, 6, 7, and 8) and non-randomized interventions (Chapters 5 and 9), is that the owners and managers of MSEs had very limited management knowledge before receiving the management training or consulting service. While the training contents were rather rudimentary in many of these studies in the literature, many participants in the training programs adopted the management practices taught in their program in almost all the studies. As is summarized in Table 10.1, the estimated effect on the management practices of the participants was positive and highly significant for the management practices or score in all the training interventions that we conducted (Chapters 4 to 9). This confirms that they had not been aware of the basic management practices before. The estimated training effect on enterprise survival is also positive and significant in the metalwork cluster in Ghana (Chapter 4). Although it could not be estimated in the other cases because the incidence of exit was negligibly low, a similar tendency was observed.

Table 10.1 A summary of the major findings in case studies of management experiments[a]

Study sites (Chapter)	Average employment size	Randomization	Training	Estimated effects on				Spillover effects	Other significant effects
				Management practices	Sales	VA[b]	π[c]		
Metalworking clusters:									
Ghana (Chapter 4)	5.9	Yes	C	+	0	+	+	n.a.	Survival
Kenya (Chapter 5)	7.2	No	C	+	0	+	+	n.a.	Self-selection
Ethiopia (Chapter 6)	72.5	Yes	C+O	+	0	0	n.a.	+	
Garment clusters:									
Vietnam (Chapter 7)	14.3	Yes	C+O	+	n.a.	n.a.	n.a.[d]	n.a.	WTP[e]
Tanzania (Chapter 8)	5.0	Yes	C+O	+	+	0	+	+	WTP and Male catch-up
Ethiopia (Chapter 9)	2.6 and 210[f]	No	C	+	0	0	0	n.a.	Self-selection

[a] + indicates positive and significant effect; 0, no significant effect; and n.a., not applicable. C, classroom; O, on-site.
[b] VA stands for value added.
[c] π means gross profit.
[d] It was too early to collect revenue data, but short-term effect on material cost was negative and significant.
[e] WTP stands for willingness to pay training fees.
[f] This study has two samples. The average employment size is 2.6 in the sample of tailors and 210 in the sample of RMG factories.

Since management complexity is supposed to increase more than proportionally with an increase in the size of enterprises, management training may have stronger impacts on larger enterprises than micro enterprises, in which there may not be room for applying the management knowledge taught in a training program. This consideration motivated us to focus on those MSEs which are larger than the self-employed, as shown in the first column of Table 10.1. An exception is the study of the garment cluster in Addis Ababa (Chapter 9). In this study, we had two samples: self-employed tailors and RMG factories. Although the self-employed tailors who participated in our training adopted the management practices taught in the program, the magnitude of the impact was rather small. According to the excellent review of management training experiments by McKenzie and Woodruff (2012), the subjects of many experiments are the self-employed type enterprises, such as the clients of microfinance institutions, and our finding of the small impacts of the training on the self-employed is consistent with the results of such experiments.

Majority of the MSEs in our samples operate in survival clusters, and they know they need to improve in some way in order to restore profitability. Why then are these owners and managers ignorant of even basic management practices? There are three possible explanations. First, a kind of market failure makes the transaction of knowledge difficult because owners and managers do not know who possesses the knowledge they want to acquire, and when they do know, they are not able to verify whether or not the person has passed that knowledge to them. Moreover, once the sellers share their knowledge, the buyers may quickly grasp and become unwilling to pay for it. Because of this asymmetric information problem, the transaction of knowledge is difficult unless the seller has established a good reputation. Second, another market failure arises from the difficulty in keeping the purchased knowledge secret. If imitation or spillover is expected to be widespread, businesses will be reluctant to pay, preferring to get a free ride.

The third explanation may be due to the ignorance of the value of learning about management. MSE owners and managers may undervalue learning while overestimating their own abilities.[3] Many owners and managers in our study sites maintain that their management is better than average. When asked how they know what the average is, they simply smile. Moreover, some owners and managers may have a tendency to put off paying for expensive activities such as learning and investing.[4]

Since owners and managers of MSEs may not be fully aware of the value of management skills, we asked our sample owners and managers

about their WTP about USD400 for management training before and after the training program in two of our experiments (Chapters 7 and 8). In these cases, the WTP for the participants increased significantly after the training. Also in these cases, the WTP increased for non-participants in the control group, who became willing to pay based on what they heard about the program. These WTP results suggest that many owners and managers were unaware of the value of training before taking the training, and that the vast majority of training participants attach high value to training after taking part in it.

Another common finding from the RCTs of management training is that the estimated effect of training on the participants' business performance measured by accounting-based performance indicators, such as sales revenue, value added, and profit, are often statistically insignificant or only marginally significant. Indeed it is not significant in the metalwork cluster in Addis Ababa (Chapter 6). In the case of the garment cluster in Vietnam (Chapter 7), a number of MSEs had not collected receivables from their customers in the short period before the follow-up survey, thus, accounting-based performance data were not available. This may be attributed to the fact that the follow-up survey was conducted too soon, only two months after the on-site training was completed and five months after the classroom training. However, it was found that the material cost was saved significantly by those who took the management training, as *Kaizen* helps eliminate the wasteful use of materials.

The impacts of management training on business performance are found to be positive and significant in three cases. In the case of the metalwork cluster in Ghana (Chapter 4), where the follow-up survey was conducted a year after the classroom training program, the estimated effect on annual value added is USD13,890 and is marginally significant. This indicates that participation in the classroom training for three weeks increased a participant's annual value added by USD13,890 on average relative to the value added that this enterprise would have produced if it had not received the training. Note that this amount is an increase in value added for the single year immediately after the training program. The training effect may persist for several years, and the estimate of the effect may be diluted by the improved performance of non-participants due to knowledge spillovers. Thus, the estimated effect of USD13,890 is likely to underestimate the social benefit of the training. The cost of the training per participant is USD740. For the experiment in this study site, we did not hire international consultants, and the venue was provided by a nearby vocational school free of charge. The

cost per participant in this study site was relatively low. It could have been even lower if the same training had been rolled out for a large number of participants because some costs, such as preparing teaching material, are fixed.

In Chapter 8 on the garment cluster in Tanzania, the follow-up survey was conducted just three months after the on-site training had been completed. Since almost all the invited owners and managers participated in the training in this site, we estimated the average treatment effect on the participants. It is estimated that the classroom training increased the annual value added of a participant by USD4,181. On-site training increased that value by USD4,038 on average relative to non-participants.[5] The classroom training cost per invited enterprise was USD2,905, which includes the fee for an international consultant from Japan and the banquet hall rental paid to one of the largest hotels in Dar es Salaam. The on-site training cost per participant was USD2,043, which again includes the fee for an international consultant from Japan. It is remarkable and encouraging that the estimated effect tends to exceed the cost despite the cost being overestimated and the benefits underestimated.

A unique contribution of this study is the finding that information spillover does occur not only from training participants to non-participants but also among participants. In Chapter 6, it was found that the number of training participants that the respondent knew has positive and significant effects on the *Kaizen* score and value added. In Chapter 8, it was found that non-participants who talked to a greater number of participants about the training tended to improve their management practice scores and business performance significantly, whereas participants who talked to a number of other participants also improved their management practices and business performance. In all likelihood, due to information spillovers, the private benefits of participating in management training are substantially exceeded by the social benefits.

According to Giné and Mansuri (2011), female training participants benefit less than male participants probably because females are faced with more severe constraints limiting their latitude in the adoption of new management practices and in the expansion of their businesses. Berge et al. (2011) measure preference variables and argue that female owners and managers perform less well because they are more risk-averse and less willing to compete than their male counterparts. In our sample of garment producers in Tanzania (Chapter 8), where female owners and managers comprise the majority, many of them operate businesses not to make a living but to have disposable income that they

can spend as they wish, according to our unstructured interviews with them. Yet we find no evidence for the underperformance of female owners and managers in terms of business performance. In terms of management skills, they were somewhat superior to their male counterparts, probably because many of them had started their businesses after receiving garment business training provided by some organizations exclusively for females. In our experimental management training program, male owners and managers participated and benefited from the training a little more than female participants. This could be a catch-up rather than the gender difference in the effect of training.

This study has also addressed the issue of what characteristics of enterprises or entrepreneurs are associated with participation in a management training program. In other words, we examined who are more willing to take the opportunity to learn about management. As we have already mentioned, many MSE entrepreneurs are not aware of the value of learning about *Kaizen* management. Still those who attach a high value to learning new knowledge in general may be more willing to participate in a *Kaizen* training program. Thus, we hypothesized that those entrepreneurs with high education and the experience of participating in management or financial literacy training are more likely to participate in our training program. Another hypothesis we postulated is that the opportunity cost of participating in a training program is higher for those entrepreneurs whose enterprise is larger because MSE entrepreneurs are busy making day-to-day decisions and busier if they operate larger businesses.

We confronted these hypotheses with the data from the metalwork cluster in Nairobi (Chapter 5) and the garment cluster in Addis Ababa (Chapter 9), where we could not randomize the assignment of sample enterprises to a treatment group and a control group, as mentioned earlier. In Nairobi, the opportunity cost hypothesis was clearly observed, and the education/training hypothesis was generally confirmed except that the effect of education and that of training experience could not be separately estimated because those who used to work at large factories and received training there were also more highly educated than the other entrepreneurs in the sample. In the garment cluster in Addis Ababa, the opportunity cost hypothesis was not confirmed, but the education/training hypothesis was clearly observed among self-employed tailors.

Among the RMG enterprises, neither the opportunity cost hypothesis nor the education/training hypothesis seems to be relevant because RMG enterprises had a few or several managers and foremen and because every RMG enterprise had a highly educated manager and many had managers

with training experience. Instead, the RMG enterprises belonged to different segments of product markets with different growth rates of demand, and only those in the stagnant market segment participated in our training program and those in the rapidly growing segment did not. This result lends support to our view that even managers of large enterprises do not know the value of learning about management because if they were aware of it, those in the rapidly growing segment would also receive the training to profit more from their growing market.

10.3 Puzzling effects of management training

Thus, the *Kaizen* management training has, in general, significant effects on management practices, and the willingness to pay training fees, but not necessarily on the financial performance of MSEs. The fact that many trainees are willing to adopt improved management practices and that many of them are willing to pay fees to attend the similar management training programs clearly indicates that management training is useful for enterprise management. The successful development of garment industries in Bangladesh and Tanzania, both of which began with training, supports such a view.

There seem to be four basic reasons for these confusing findings. First, the data on sales and cost are "noisy," as many of the entrepreneurs do not keep financial records. Second, enterprise performance depends on so many factors that identifying the pure effects of training on business performance is extremely difficult. This is the case, particularly when sample enterprises belong to different industries, which are subject to different "shocks" and booms. In order to avoid such heterogeneous effects, this study focused on MSEs in the industrial clusters, which belong to the same or highly related industries. It must also be emphasized that training participants are highly heterogeneous, so that only a limited number of them learn a lot of useful knowledge from training, apply them into practice, and increase profit, whereas many others do not. This is consistent with the view of World Bank (2012) that the majority of self-employed owners do not have enough entrepreneurship skills. This may explain why the estimated coefficient of training may show large expected economic benefit, even though it is statistically insignificant. Given the small sample size for the management experiments, however, it is impractical to identify the traits of managers and owners indicative of promising entrepreneurship from the RCTs.

Third, the spillover effect blurs the impact of management training. We now have ample evidence from our case studies that treated groups

or participants in the management training talk about its contents to control groups or non-participants, so that the pure effect of training is underestimated from the comparison between the treatment and control groups. Since we focused on the industrial clusters, spillover effects are likely to be pronounced.

Fourth, while our experimental training programs taught the basics of management, such as the importance of keeping records, how to make business plans, and the importance of identifying good customers, such basic management training may not be particularly useful for self-employed micro enterprises, as the complexity of management is far less than for enterprises employing several or tens of workers. Therefore, such management training is likely to have no visible effects on the business performance of micro enterprises, even if they adopt improved management practices.

10.4 Issues for future research

Although basic management training may be useful for MSE owners unfamiliar with improved management practices, it will be more useful to teach more advanced management issues to more ambitious and competent owners and managers of MSEs who want to expand their businesses. In order to determine what training contents are useful and cost-effective, we may recommend a set of RCTs for intermediate and advanced levels of *Kaizen* management training.

It is also important to examine the process in which new management techniques are implemented within an enterprise, involving the internal training of workers. The diffusion process of new management techniques and other knowledge is also worth investigating. Another item on the agenda is to determine how to ensure a good match between training contents and participants. We need to better understand the major determinants of participating in these types of training programs and what participants have successfully applied to their business. The compilation of further studies in these directions is warranted because the overall impact of a management training program increases with both its pure causal effect and the participation of persons who are more motivated to learn from the training.

In Chapters 6 to 8, we examined the impacts of both the classroom training and the on-site training on management scores. The evidence supports the view that on-site training has larger and more significant effects on *Kaizen* management, whereas the classroom training has larger and more significant effects on non-*Kaizen* management. It is difficult

for training participants to understand how to apply the knowledge of *Kaizen* without experiencing concrete examples. So for learning *Kaizen*, on-site training and visiting other participants' workshops seem to be effective. Another related finding is that while the effect of on-site training on the adoption of *Kaizen*-type practices does not depend on the participant's educational level, the effect of classroom training on the adoption of business development service (BDS)-type practices does. This is an important point in designing the whole management program and, hence, further inquiries are warranted.

Knowledge spillovers are a vexing problem for researchers who want to estimate training effects, but they are socially beneficial. To design better training programs, we should pay more attention and devote more efforts to explore what type of knowledge is easy or difficult to spread, what the major channels of spillovers are, and how fast and how accurately knowledge is conveyed through spillovers. We believe that greater efforts should be made to sort out the spillover effects from the pure effects of management training, rather than avoiding the spillovers in the management training experiment, because more often than not, MSEs are clustered in small areas where information spillovers tend to be rampant. The data generated by our experiments in Ethiopia (Chapter 6) and Tanzania (Chapter 8) suggest that knowledge spills over not only from participants to non-participants but also from participants to participants. Also, participants benefit from talking about the training contents to others. In other words, you can better yourself by observing others, and the best way to learn something is to teach it. To the extent that these results are robust, it is useful to increase opportunities for participants to discuss management and to visit each other, for example, by encouraging them to organize alumni associations, because it is useful to observe real examples of the application of the *Kaizen* concepts that they learnt in class.

To design better training programs, what to teach and how to teach are critical issues to be explored. These issues, however, have not received due attention in the existing studies of management training. A major exception is the study by Drexler et al. (2014), which compares different ways of teaching bookkeeping. Traditionally, Japanese businessmen, business consultants, and foreign-aid workers are fond of teaching *Kaizen*, which is now adopted by a number of large firms in developed and emerging economies, often under the name of lean management. BDS providers who received, say, the ILO's entrepreneurship and business management training must have heard of *Kaizen*, but they do not allocate much time to it when they serve as instructors in training

programs. Indeed in our experience of hiring them as instructors in our experiment projects, they are excellent at teaching entrepreneurship, business strategy, marketing, and record keeping, but not *Kaizen*. The results of our training experiments indicate that training participants appreciate both *Kaizen*-type and BDS-type training. Therefore, we have designed our programs to include both. However, it is not clear at this stage what the best mix of the two is.

10.5 Toward an effective industrial development policy

We found that not all entrepreneurs of MSEs are promising innovative entrepreneurs. It is obviously absurd to support all entrepreneurs for industrial development regardless of their growth potential. This suggests that 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 feasible after management training is provided because promising entrepreneurs, after receiving the training, will show a visible change in the way in which they manage their workshops and their workers. Some of them clean their workshops, communicate effectively with their employees, attempt to improve product quality, and plan to expand the size of operation.

The asymmetric information problem may be mitigated if management training programs are provided by organizations with good reputations, such as governmental or international organizations, foreign-aid agencies, well-known companies, and NGOs. The gap between the social and private benefits of owners and managers' acquiring management skills may be bridged by government support for management training or the provision of financial incentives to either owners or managers who learn management skills.[6] Public awareness campaigns may help address the ignorance regarding the value of management skills. Owners and managers who tend to procrastinate may be nudged into action if microfinance or some other favorable treatment is linked with participation in a training program.[7] Implementing these programs to assist MSEs is unlikely to lead to serious corruption, compared with infrastructure projects (Shleifer and Vishny, 1993).

Although this book focuses on cultivating managerial and innovative capacities, financial development and infrastructure development are also important for enterprise growth and industrial development. What is worth emphasizing here is that management training can have additional and, possibly, magnified impacts if it is linked with finance and infrastructure development. High-performing firms require finances not

only to invest in capital goods but also to move from their original and often congested industrial clusters to more spacious and better-equipped industrial zones. If a training program is provided before offering low-interest credits, it is relatively easy for banks to distinguish between innovative, promising entrepreneurs and other entrepreneurs. It is, therefore, desirable to link management training programs with the provision of credit and space in the industrial zone. In this way, enterprises with improved managerial and innovative capacities and, hence, higher ability to repay loans, will be more likely to receive loans and relocate their production bases with expanded scales of operation.

Thus, as an industrial development strategy, we propose the screening of 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. Such a development strategy may be termed "industrial development policy" focused on human capital-led development, as distinct from "industrial policy" focused on the transfer of modern factories and machineries, which created political failures without correcting market failures.

10.6 Conclusions

The pace of industrial development is determined by the speed of learning new technologies and improved management practices and disseminating them. The market for management and technology consulting and training services, however, is likely to fail, partly because knowledge spillovers create a gap between the social and private benefits of acquiring managerial and technological capacity, and partly because many owners and managers are not aware of the importance of management knowledge. In this book we argue that to help MSEs grow in developing countries, proper management training should be supported by the government, foreign-aid agencies, and international organizations. In Taiwan, the Industrial Technology Research Institute has facilitated the import of foreign technologies and disseminated them by means of adaptive research and training (Hou and Gee, 1993). To our knowledge, in SSA, there have been no effective institutions in charge of adaptive research and training toward improvements in production and management.

In Ethiopia, the late Prime Minister Meles Zenawi took the powerful initiative to establish the Ethiopian Kaizen Institute (EKI) in collaboration with JICA in 2011. It is hoped that this institute will serve as a role model of a collaboration between a foreign-aid agency and the

government that attempts to foster entrepreneurship and industrial development in developing countries. In this institute, promising local, young, and educated staff are trained by experienced Japanese *Kaizen* management experts with a view to disseminating management skills adapted to the local context by such trainees. We expect such foreign-aid programs to reach a high success rate in fostering entrepreneurship, facilitating innovations or a series of improvements, and eventually boosting MSE development.[8]

Much remains to be studied about the design of management training programs for owners and managers, public awareness campaigns, trainers' training and quality assurance systems, and the overall strategy of the dissemination and adoption of improved management practices, including *Kaizen* management. In this study, we argue, based on our case studies, that management training programs are likely to have significant impacts. They should facilitate learning from the experience of multifaceted improvements in production and management and nurture innovative capacities. Considerably many more empirical studies are warranted in the study of constructing effective industrial development strategies. We would like to propose that each developing country build effective institutions that facilitate the dissemination and adoption of new technologies and management practices in earnest. To be successful, entrepreneurship must be identified and nurtured before providing financial support and infrastructure.

Notes

1 Introduction

1 Here we distinguish between a cluster which has been established by local firms and one led by FDI. 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.
2 See, for example, Bloom and Van Reenen (2007, 2010), Bloom et al. (2010, 2013), Bruhn et al. (2010), and Syverson (2004, 2011).
3 In this study, we refer to owners or other ultimate decision makers of enterprises as entrepreneurs, regardless of their entrepreneurial skills.
4 Our approach is consistent with the theoretical proposition of Rodriguez-Clare (2007) that the best industrial policy entails the promotion of industrial clusters in the sector in which the country has a comparative advantage.
5 The metalwork cluster is ubiquitous in developing countries essentially because it provides services and parts for car-repair shops, which are vitally important for the long-term use of cars and trucks.

2 Innovation and Cluster Development

1 A large number of industrial clusters have developed in Japan, particularly in the weaving industry in its modernization process from the late nineteenth century to the early twentieth century (see, for example, Hashino and Otsuka, 2013a, 2013b).
2 Eight case studies each are reported by Sonobe and Otsuka (2006, 2011) and six case studies are reported in Chapters 4 to 9 in this book.
3 Buenstrof and Klepper (2009) also observe that spin-offs played a critical role in the formation of a huge automobile tire cluster in Akron in Ohio.
4 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.
5 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.
6 This case is dealt with in Chapter 8.
7 This section is based on Yamamura et al. (2005).
8 The quality index formula is (horsepower)/(displacement volume)$^{2/3}$.
9 This section draws on Sonobe et al. (2004).
10 Table 2.1 shows data collected from 112 sample enterprises.
11 Smyth and Lu (2000) discuss the formation of large enterprise groups in the late 1990s.

12 No enterprise in the sample originated as a subsidiary.
13 The local government also supported the development of this industry by constructing industrial zones with improved infrastructure.
14 This section draws on Mottaleb and Sonobe (2011).
15 This section depends on Amin and Sonobe (2014).

3 Management and Innovations

1 This chapter draws on Sonobe et al. (2014).
2 An example of the non-negative random variable is a random variable distributed uniformly between 0 and a, where $a > 0$.In this case, $\mu_\theta = a/2$, and $\sigma_\theta^2 = a^2/12$. Thus, a reduction in the variance σ_θ^2 reduces the mean μ_θ. Another example of the non-negative random variable is the absolute value, $|x|$, of a normally distributed random variable with mean zero, $x \sim N(0, \sigma_\theta^2)$. The mean is $\mu_\theta = \sqrt{2/\pi}\,\sigma_x$ and the variance is $\sigma_\theta^2 = (1-2/\pi)\sigma_x^2$, where π is the circular constant, not the profit. Hence, a decrease in σ_θ^2 decreases μ_θ.
3 Suppose that the inventory cost is proportional to the square of the difference between actual output and the optimal volume of inventory, I, and that I can be freely chosen. Then I will be equal to the mean of the output, which leads to the assumption made in the text.
4 If we change our model slightly so that the value added of the firm is not assumed to be $(p - \theta)F(L)$ but $p(1 - \theta)F(L)$, even an increase in p will not shift curve AE as much as curve ACD because the second term in this case is $-\gamma p 2\sigma_\theta^2 F(L)F'(L)$.
5 These reasons for the localization of industries were pointed out by Marshall (1920). Guiso and Schivardi (2007) confirm that the larger the information spillovers are, the greater the product similarity and geographical proximity.
6 The scatterplots share the same scale on each axis to allow comparison among the clusters and are useful for seeing whether the data are consistent with our hypotheses. The same applies to panels a and b of Figures 3.3 to 3.5.
7 This monthly value added per worker is not the value added per worker in a particular month, but it is the value added in a year divided by the number of months worked and the number of workers.
8 The numbers 3, 30, and 300 on the horizontal axis stand for 3 persons, 30 persons, and 300 persons.
9 Note that the scale is logarithmic on the horizontal axis.
10 This case will be further analyzed in Chapter 7.
11 According to our interviews with the entrepreneurs in the sample, everything related to the training program was a popular topic of discussion during the program. Also note that there is a possibility that the variance of labor productivity was lower in 2010 than in 2009 partly because of the temporary fall in the market demand rather than the impact of management training.
12 In the panel of Forbes 500 CEOs, Malmendier and Tate (2005) find that overconfident CEOs overestimate investment returns.
13 There is a growing literature on procrastination (e.g., O'Donoghue and Rabin, 1999). A number of RCTs have confirmed the existence of procrastination.
14 In the garment cluster in Dar es Salaam, Tanzania, the classroom training program had four modules and lasted four weeks. Three modules were the same as in the other study sites, and the fourth was about color coordination and other aspects of the design of garment items.

15 In the on-site training program, instructors visited participants' firms to teach them how to apply a simple technique of *Kaizen* to their workshop or factory, and the instructors visited the firm again to check if the application was going well and to give further advice.
16 In the other clusters, there has been no exit among the participants, even though there have been very few exits even among the non-participants.
17 The training effects on value added in the Tanzanian case shown in Table 3.2 were estimated by comparing the quarterly value added from January to March in 2010 and those in 2011.
18 The cost per participant shown in Table 3.2 includes the costs of local and international consultants' preparation of teaching materials, their travel and accommodation costs, and the cost of renting the venue. The cost was low in the metalworking cluster in Ghana because international consultants were not hired and because the venue was provided by a nearby vocational school free of charge. The cost was high in Tanzania because a large room in a hotel in the center of the capital city was used as the venue.

4 The Large but Varying Effects of Basic Management Training in a Metalworking Cluster in Kumasi, Ghana

1 This chapter draws on Mano et al. (2012).
2 This area used to be the site of an army depot called Magazine during the colonial times. The name Magazine has been adopted by similar engineering clusters in the northern part of Ghana, whereas those in the southern part are called Kokompes.
3 McCormick (1999) provides a bird's-eye view of this cluster.
4 The training program was funded by the Government of Japan through its Policy and Human Resource Development (PHRD) trust fund at the World Bank.
5 The program was modeled on the "Business Course" provided by the Japan International Cooperation Agency (JICA) in eight transition economies; Cambodia, Kazakhstan, Laos, Mongolia, Ukraine, Uzbekistan, Kyrgyzstan, and Vietnam.
6 The lead consultant was an SYB master trainer. The instructor in charge of Module 2 had received training in metalwork in Japan and was familiar with *Kaizen*.
7 Including the pre-selected participants, the majority of the participants recorded perfect attendance. At the end of the program, the participants evaluated the program as follows: 98 percent found the program very important to their business, 94 percent had learnt very much, and 96 percent were satisfied with the program.
8 When we revisited the study site a year later, we found that 11 of these 17 firms had been temporarily closed at the time of our survey and then resumed the same businesses.
9 We usually began by asking about the price of each product and the output in a busy month and in a slack month, together with a question about when the workshop was busiest. If the respondent was unsure, we changed tack and asked, for example, how many units of a product were produced from one unit of a material, and how often and how many units of the material were purchased in a busy month and in a slack month.

5 Improved Performance of Small but Trained Firms in a Metalworking Cluster in Nairobi, Kenya

1 This chapter draws on Mano et al. (2014).
2 The literal translation of Jua Kali is "hot sun," and this term refers to informal-sector artisans because they work outside under the hot sun.
3 These entrepreneurs are much more highly educated than average workers in Kariobangi, who would have eight years of education or so even though we did not collect data of workers systematically. According to Fafchamps and Söderbom (2006), the mean of the years of schooling is 8.5 for workers and 11.6 years for supervisors in the manufacturing sector in various countries in SSA, and the corresponding figures for the manufacturing sector in Morocco are 7.3 and 13.9, respectively.
4 Because 14 participants attended all the training sessions, we also estimated the attendance rate regressions with the Tobit method. The estimation results are essentially the same as the OLS estimates reported in Table 5.3.
5 For 2008, we estimated the values in an average month during the period of six months after the training program. In the analysis below, we used the estimated values in an average month in the second half of the year in the other data years as well.
6 The test score is correlated with sales revenue, value added, and gross profit, and the pairwise correlation coefficients are 0.10, 0.11, and 0.13, respectively. The *p*-values for these correlation coefficients are 0.14, 0.13, and 0.06, respectively.
7 The pairwise correlation coefficients between the test scores on the one hand and keeping records, analyzing records, and set in order on the other are all higher than 0.30, and the *p*-values are all less than 0.01.
8 Because 19 firms entered the market from 2001 to 2005, the panel is balanced only from 2005, which is well before providing training program. Although not reported, the estimation results of analyzing balanced panel from 2005 to 2008 is very similar to the results reported in Tables 5.5 and 5.6.
9 The significantly low sales revenue in 2006 can be explained by a fire in Kariobangi in that year.
10 Matching methods have been widely applied to non-experimental data from developing economies (Diaz and Handa, 2006; Park and Wang, 2010; Todo, 2011). For example, Rosholm et al. (2007) use the PSM to evaluate the impacts of technical training programs on labor productivity for workers in Kenya and Zambia, and Behrman et al. (2009) use both DID-PSM and DID-BCM to evaluate schooling impacts of conditional cash transfers on young children in Mexico.
11 We use STATA command *psmatch2* (version 3.1.3) developed by Leuven and Sianesi (2008) to implement the DID-PSM matching.
12 These advantages include a faster rate of convergence near boundary points and greater robustness to different data design densities. See Fan (1992, 1993).
13 In contrast to regression adjustment estimators, bias-corrected nearest-neighbor matching estimators have the disadvantage of not being fully efficient (Abadie and Imbens, 2006).

14 When we additionally incorporated the sales revenues in 2002 to 2007 into the probit model, the resulting PSM estimates of the *Kaizen* training effects were not very different from the estimates reported in this study.
15 We also tried to additionally incorporate the sales revenue only in 2005 into the probit model, and obtained associated PSM estimates of the *Kaizen* training effects quite similar to the estimates reported in this study.

6 Effects of Classroom and On-site Training in a Metalworking Cluster in Addis Ababa, Ethiopia

1 Unfortunately, even for these 100 enterprises, data are not complete because the sales and cost data of a few enterprises were so unreliable that we had to eliminate them from the sample.
2 The results shown in this table, however, cannot entirely be accounted for. We find it difficult to explain why the coefficients on the non-Ethiopian dummy, which indicates whether the entrepreneur is foreigner or Ethiopian, and the number of entrepreneurs that the entrepreneur knew before the training programs are positive and significant in columns (3) and (4).

7 Increasing Interests in Management Training in a Knitwear Village in Hatay, Vietnam

1 This chapter draws on Suzuki et al. (2014).
2 As there was no official list of these enterprises, we surveyed the leaders of all the residential blocks of the village to obtain the total number of enterprises.
3 Once the teaching materials are prepared and training contents are standardized, it is not impossible to reduce the cost of the training program per participant to USD155 in future.
4 The WTP question is hypothetical also in that when the question was asked of the training participants during the follow-up surveys, we asked whether they would pay 3 million VND to participate in the training program if they had not received the training.
5 This is what Blumenschein et al. (2008) recommended us to do in our personal communication with them.
6 One seasonal worker is considered as one-third of a permanent worker based on the average number of months worked in a year by each type of worker.
7 If our data are of unbalanced panel, however, these equalities do not hold true.
8 The conditional endogenous quantile effects estimation was developed by Abadie et al. (2002).We used the conditional endogenous quantile effects estimator as well and found that the results are qualitatively the same as Figure 7.2.
9 Our panel data are no longer balanced because we failed to collect data on the business score and material costs from some enterprises. For this reason, the relationships among coefficients mentioned in the previous section, such as $\lambda_1 + \lambda_2 = \beta_1$, do not hold true in Tables 7.7 and 7.8.

8 Spillover Effects of Management Training in a Garment Cluster in Dar es Salaam, Tanzania

1 The same result was found for the US' Project GATE in which the entrepreneurship training program had a lower impact on female participants in terms of business start-up (e.g., Fairlie et al., 2012).
2 Goetz and Gupta (1996) also contend that the loans offered to women in rural Bangladesh are controlled more by some male relative than the female borrowers.
3 Fafchamps et al. (2011) also find that female entrepreneurs in Ghana do not benefit from a financial grant provided in cash because of present bias in favor of its immediate use.
4 In their experiment, Gneezy et al. (2009) asked the subjects to toss a tennis ball into a bucket that was placed three meters away. Before starting this game, each subject was then asked to choose between (a) TSZ500 per successful shot after ten tosses, regardless of the performance of other subjects, or (b) TSZ1,500 per successful shot if the subject outperformed the other subjects. Thus, the authors regard the choice of option (a) as the "competitive choice."
5 While Table 8.14 presents the data of the training participants and non-participants combined, almost the same qualitative results are obtained if we focus on the management-practice scores of the participants only.

9 Self-Selection into Management Training Participation in the Garment Industry in Addis Ababa, Ethiopia

1 BPR is a business management strategy advocated by Hammer and Champy (1993) among others. Like *Kaizen*, BPR improves efficiency by removing the work that adds no value for customers. Unlike *Kaizen*, BPR removes such work in a top-down fashion, and, thus, it often justifies downsizing.
2 Of the 16 questions about record keeping, seven questions concern sales, seven concern purchase transactions, and two concern inventory of work in process and finished goods.
3 In addition to the data in the two survey years shown in Table 9.2, the estimation of the FE model uses recall data whenever available, even though the results are similar to those obtained without using the recall data. In the application of DID-PSM, we imposed a common support, following Heckman et al. (1998).
4 The right-hand side of the equation does not include the variables representing the characteristics of entrepreneurs and enterprises because they are time-invariant.

10 New Industrial Development Policy: *Kaizen* Management Training as a Key to Cluster-Based Development

1 The garment cluster is common because of the ease of production even by unskilled workers, whereas the metalwork cluster is ubiquitous importantly because it provides services and parts for a large number of car-repair shops.
2 See, for example, Bjorvatn and Tungodden (2010), Bruhn et al. (2010), Drexler et al. (2014), Field et al. (2010), Karlan and Valdivia (2011), and Chapter 4.
3 In the panel of Forbes 500 CEOs, Malmendier and Tate (2005) find that overconfident CEOs overestimate investment returns.
4 There is a growing literature on procrastination (e.g., O'Donoghue and Rabin 1999). A number of RCTs have confirmed the existence of procrastination.
5 Note that the effect of the on-site training would be more difficult to be realized by the time of the follow-up survey because the on-site training was implemented after the classroom training.
6 Reviewing various policy options to facilitate industrialization in SSA, Page (2011) concludes that strengthening the managerial capabilities of firms and facilitating clustering are key policy measures.
7 There are already a number of management or business training programs linked with microfinance provision, including the training programs discussed by Karlan and Valdivia (2011) and Bjorvatn and Tungodden (2010).
8 When we were preparing this book manuscript, we were invited to Tanzania to give a keynote speech on "*Kaizen* Management for MSE Growth" for policymakers including President Jakaya M. Kikwete on April 9, 2014. He reacted to our recommendations positively.

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