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Do Management Interventions Last? Evidence from Vietnamese SMEs

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Abstract: *We conducted randomised experiments to provide management training for 312 small Vietnamese manufacturers in 2010 and repeatedly collected follow-up data in the span of a decade. Analysing panel data constructed from our original surveys with an attrition rate of 4%, we find that our training significantly improved the management quality of the treated entrepreneurs, and such improvement was sustained for at least 5 years. The control entrepreneurs, however, caught up in the longer run.*

Keywords: management training, Kaizen, small and medium-sized enterprises, RCT, Viet Nam.
JEL Classification: L2, M1, O1

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1. Introduction

While entrepreneurs play a central role in productivity growth and job creation in the developing world, their managerial capacity is severely limited (e.g. Bloom et al., 2012; McKenzie and Woodruff, 2017). In recent years, there has been renewed interest in managerial capacity building through business training. Based on randomised controlled trials (RCTs), an accumulating body of literature found that training can improve management capacity (see the latest survey by McKenzie, 2021).

These studies have provided evidence that there is much room for productivity growth through managerial capacity building and helped us understand what approach to managerial capacity is relatively effective in different situations. However, they have also raised new questions. An important open question is how sustainable the positive impact of these business training programmes is on firms. To address this question, Bloom et al. (2013; 2020) analysed the impacts of randomised business training 8 years after the intervention. The training was provided to 17 large Indian textile firms with a median employment size of 250, and it was a year-long, intensive, and expensive one. Although their study found a sustained impact, it is difficult to roll out such a costly training programme to a multitude of entrepreneurs and firms in the developing world.

In this paper, we investigate whether the impact of a much lower-cost, shorter duration, and hence more scalable training programme has sustained impacts on the productivity and other aspects of the performance of small and medium-sized enterprises (SMEs). We analysed the follow-up data collected over 10 years after the randomised training programme we provided to 223 Vietnamese SMEs in 2010. Higuchi et al. (2015) analysed the data collected 2 years after the intervention and found significant and economically large training impacts on management practices and firm performance. We extended the evaluation period to examine its longer-term impacts.

Our sample consists of SMEs operating in two industries: 159 garment firms (including the 105 treated firms) and 153 metalwork firms (including the 118 treated firms). The median employment size was 8 and 17 for each group of firms. Thus, they are more representative firms in developing countries in terms of their size than the sample of Bloom et al. (2020). Further, while all of their sample 17 firms survived 8 years after the intervention, a non-negligible number of our sample SMEs stopped their operation because exit and entry rates are higher for smaller firms in the developing

world. Hence, we analysed how the training programme affected firm survival.

This paper primarily contributes to the literature on business training, in particular, its longer-term impact evaluation. In addition to the aforementioned Bloom et al. (2020), Giorcelli (2019) found that a large-scale managerial knowledge transfer from the US to medium to large Italian firms after World War II had increasing impacts over time and had significant impacts even 15 years after the transfer. Bianchi and Giorcelli (2022) obtained similar results for the US domestic programmes to transfer management knowledge. Our study revealed whether less expensive and shorter-term training programmes had favourable and sustained impacts on smaller firms.

This paper also contributes to two existing strands of literature. Firstly, our study contributes to the established literature on firm survival (e.g. Dunne et al., 1989; Evans, 1987). In the empirical studies following these early theoretical papers, the main explanatory variables of firm survival included firm size, age, and entrepreneurs' human capital. We argue that management also matters for firm survival. Secondly, this paper contributes to the emerging literature on identifying gazelles – firms with high growth potential (e.g. Diao et al., 2020; Fafchamps and Woodruff, 2017; Grimm et al., 2012). Since McKenzie and Sansone (2019) found that neither machine learning technique nor expert judgment successfully predicted gazelles, an alternative is self-screening. We observed that firms selectively decided to participate in the training, and we found that the training participants performed better for at least several years. Hence, we argue that the provision of management training can be used as a screening device for identifying high-performing firms.

The remainder of the paper is organised as follows. Section 2 explains the experimental design and checks the balance. Section 3 describes the empirical strategy and presents the results, and Section 4 concludes with implications for policy and future studies.

2. Experimental Design

In this section, we begin with a brief description of the context of our study. We subsequently explain the content of our intervention and the timeline of our research. Lastly, we discuss the internal validity of our research.

2.1. Study Sites and Sample Firms[1]

Since our ultimate goal is to prescribe an effective policy for industrial development in developing countries, we are interested in evaluating training impacts in industrial clusters, which enjoy various benefits of agglomeration economies (Fujita et al., 1999). Indeed, the vast majority of firms are located near other firms producing similar or related products (e.g. Atkin et al., 2017; Bassi et al., 2021; Sonobe and Otsuka, 2011). Conducting an RCT of management training in an industrial cluster has both advantages and disadvantages. A major advantage is that sample firms face the same prices of the product, factors, and intermediate inputs, and they have the same access to infrastructure because they produce the same products in geographical proximity. This reduces heterogeneity amongst sample firms, thereby facilitating statistical inference. The major difficulty in empirical analysis of firm-level intervention is the statistical power as reviewed by McKenzie and Woodruff (2014). The sample size tends to be smaller than the individual- or household-level interventions, and business performance indicators tend to be noisy with large variances and low autocorrelations (de Mel et al., 2009).

A major disadvantage is that imitation may be rampant in industrial clusters. Management practices and business performance might improve even for those firms that did not receive training, which would lead to underestimating training impacts unless market-level randomisation like McKenzie and Puerto (2021) is adopted. We have not applied any such method to capture spillover effects rigorously.

The two industrial clusters in our study were selected from over 2,000 village industrial clusters throughout Viet Nam, which have spontaneously developed and produced traditional craft items. These clusters had contributed to rapid economic growth since 1986, when the Vietnamese economy was liberalised by Doi Moi

[1] See Higuchi et al. (2015) for a more detailed description of the selection of study sites and sample firms.

(Renovation) policy (Oostendorp et al., 2009). In 2007, Nam et al. (2009; 2010) conducted firm surveys in two of these clusters that have successfully started producing modernised items. We chose the same two clusters as our experiment sites partly because of our contextual knowledge and the established rapport. Further, they were representative clusters of modern products in semi-urbanised areas in Viet Nam regarding the number of firms, the employment size per firm, and some other aspects.

The two clusters are located in the suburbs of Hanoi, about 15km from the city centre but in different directions: one cluster produced has steel products, and the other has produced knitwear and garment products. In the steel cluster, Nam et al. (2009) surveyed 204 firms randomly selected from 372 firms in a list provided by the local government office in 2007. We found that, amongst the 204 firms, 155 were still in operation before the training intervention in 2010. These 155 firms consist of our baseline sample steel manufacturers in this study. In the knitwear cluster, Nam et al. (2010) surveyed a total of 138 firms in operation in 2007, though the collected data were lost due to an accident in late 2008. According to a new list compiled in 2010 by the commune government office, the total number of knitwear firms was 161, all of which consist of our baseline sample of knitwear manufacturers.

2.2. Intervention and Timeline

A typical sample firm under our study employs about 10–20 workers. When a firm has no employees, what business owners/managers must know about management would be their self-management, financial management, and marketing. When a firm has many employees, they also need to know how to coordinate the division of labour. Thus, our experimental training programmes covered not only basic accounting, marketing, and business strategy as often adopted in the existing studies (McKenzie, 2021; McKenzie and Woodruff, 2014), but also elementary training in *Kaizen* management. *Kaizen* is an approach to production management and quality control aimed at improving the coordination amongst workers (Imai, 2012). We contracted with a business consulting firm in Japan to dispatch a *Kaizen* expert to our study sites. We also hired a local consultant, qualified as a master trainer of the International Labor Organization's (ILO) Start/Improve Your Business (SIYB) training, and her co-trainer. The *Kaizen* expert taught the local consultants in English, and the latter taught the

training participants in the local language. Bloom et al. (2013; 2020) found that an extensive training programme featuring lean manufacturing, an American version of *Kaizen*, effectively improved management practices and productivity at Indian large textile firms. It remains an open question whether less intensive training programmes can improve smaller-sized firms.

The training programmes had two components in the two clusters: one offered classroom lectures for 2.5 hours a day, 5 days a week over a 3-week span (total about 40 hours), and the other sent trainers to participants several times to provide coaching specific to respective firms. In each of the two study sites, the sample was randomly divided in half, and one-half was invited to participate in the classroom training component. From amongst the classroom training participants, the instructors selected two firms in each cluster to make them model firms, which served as showcases of *Kaizen* practices. At the selected four firms, the instructor team convinced the owner/managers to change the layout of their workshops.

Subsequently, stratified by the invitation status to the classroom training, the sample was further randomly divided in half, and one-half was invited to the on-site training component. On-site training began with a 1-day seminar. The model firm managers gave presentations about their firms' physical changes and the responses from their workers as well as their own opinions. After the seminar, the instructor team visited each participants' firm at least two times depending on the availability and willingness of the participants to demonstrate how to encourage workers to improve their work environment, productivity, and product quality. The four model firms were not randomly selected as they were required to showcase their changed workshop and have enough space to welcome on-site training participants to observe the changes; we excluded these firms from our empirical analyses.

We collected the baseline data from a total of 312 firms before the randomised management training in 2010 and collected the follow-up data in 2011, 2013, 2016, 2017, and 2021. Higuchi et al. (2015) analysed the baseline data and the follow-up data collected in 2011 and 2013, and this study further combines the 2016, 2017, and 2021 data. The timeline of the training programmes and surveys is presented in Table 1. We used a structured questionnaire and an interview to collect data from entrepreneurs, and the use of the same questionnaire enabled us to construct firm-level panel data. The

latest follow-up survey allowed us to evaluate training impacts a decade after the intervention.

Table 1: Timeline

	(1) **Steel**	(2) **Knitwear**
Baseline survey	2010 June *N*=153 (153)	2010 July *N*=159 (159)
Classroom training programme	2010 June–July or September	2010 July–August
Interim survey	2010 October *N*=153 (153)	2010 September *N*=159 (159)
On-site training programme	2010 December–2011 February	2010 December–2011 January
1st follow-up survey	2011 April *N*=153 (153)	2011 April *N*=159 (159)
2nd follow-up survey	2013 January *N*=153 (128)	2013 January *N*=158 (146)
3rd follow-up survey	2016 January *N*=153 (90)	2016 February *N*=154 (111)
4th follow-up survey	2017 February *N*=148 (94)	2017 March *N*=155 (112)
5th follow-up survey	2021 April *N*= 149 (80)	2021 April *N*= 152 (92)

Note: Two model enterprises in each cluster are excluded from the sample. *N* stands for the number of surveyed enterprises. In the parenthesis, the number of survived enterprises amongst the surveyed enterprises is reported.
Source: Authors' data.

When analysing the long-term impacts, it is important to minimise the attrition rate. The established relationship between us and the two industry clusters enabled us to do so because the local leaders of the clusters and many entrepreneurs were cooperative with our survey. In addition, we collected data from the exit firms to analyse the firm survival and reasons for the exit. To track the exit firms, we asked their relatives and former neighbours about their current location and contact address to interview them. With such intensive efforts, the attrition rate (including those who exit the original business) was less than 4% of the original 312 firms in the 2021 survey.

2.3. Internal Validity

The internal validity of the RCT was tested and reported in Higuchi et al. (2015). Importantly, the training was one-shot and was not in a cross-over RCT design, and the control firms have remained as control. We group the total of 312 baseline samples (153 in the steel cluster and 159 in the knitwear cluster after excluding the four model firms) into three treatment groups and a control group. The first treatment group was invited to both classroom and on-site training programmes and labeled as 'Class + Onsite' Group. The second and third were invited only to either the classroom or the on-site programme and labeled 'Class-only' group and 'Onsite-only' Group, respectively. 'Control' Group was invited to neither of the programmes. The sample size of each group is shown at the bottom of Table 2. Note that the number of samples in each group is unbalanced. Since we had found that their *ex ante* willingness to participate in the training was not high, we decided to invite more than half of the baseline sample to the classroom training. After the classroom training, we stratified the sample by the classroom invitation status and invited randomly selected firms from both strata to the on-site training. Given the budget constraint and the capacity constraint of the instructors to train on-site training recipients, we invited a larger number of firms from the stratum that were invited to the classroom training. This enabled us to secure a certain number of firms that would receive both components of the training. The number of samples in 'Onsite-only' Group is particularly small.

While 108 firms in the steel cluster were invited to the classroom training programme, only 41 firms participated. In the knitwear cluster, 89 firms were invited, and 52 firms participated. We issued a certificate to the firms that participated for at least 10 days of the classroom training out of 15 days. We defined only the certificate holders as classroom training participants. The take-up rate was 38% and 58% in the steel and knitwear clusters, respectively.[2] By contrast, the take-up rate of the on-site training was 100% in both clusters because no firm refused to accept the consultants' visits. There were no uninvited participants in any training programme.

[2] Four steel firms and 16 knitwear firms participated for less than 10 days. Thus, the take-up rate for at least one classroom training was 42% in the steel cluster and 74% in the knitwear cluster.

Table 2: Balance Check

	(1) Steel Class + On-site mean	(2) Steel Class-only mean	(3) Steel On-site-only mean	(4) Steel Control mean	(5) Steel (1), (2), (3) v.s. (4) *p*-value	(6) Knitwear Class + On-site mean	(7) Knitwear Class-only mean	(8) Knitwear On-site-only mean	(9) Knitwear Control mean	(10) Knitwear (6), (7), (8) v.s. (9) *p*-value
Panel A: Control variable										
Age	40.19	38.47	38.60	37.74	0.43	38.81	39.19	37.31	39.20	0.80
(as of the baseline)	(6.84)	(7.77)	(7.76)	(8.88)		(8.05)	(9.50)	(8.56)	(11.22)	
Male	0.47	0.43	0.50	0.57	0.21	0.28	0.42	0.44	0.35	0.72
(yes = 1)	(0.51)	(0.50)	(0.53)	(0.50)		(0.46)	(0.50)	(0.51)	(0.48)	
Years of education	6.81	6.79	6.20	7.17	0.43	7.75	7.98	8.63	8.50	0.32
	(2.86)	(2.60)	(2.94)	(3.25)		(2.27)	(2.88)	(3.40)	(3.21)	
Business training experience	0.03	0.01	0.10	0.03	0.92	0.16	0.14	0.25	0.06	0.06
(yes = 1)	(0.18)	(0.11)	(0.32)	(0.17)		(0.37)	(0.35)	(0.45)	(0.23)	
Panel B: Outcome variable										
Baseline *Kaizen* score	7.25	6.63	6.60	6.17	0.03	3.63	3.58	4.44	3.80	0.76
(0–11)	(1.44)	(1.45)	(1.84)	(1.46)		(1.16)	(1.28)	(2.19)	(1.28)	
Baseline management score	N.A.	N.A.	N.A.	N.A.	N.A.	13.22	12.81	15.25	13.30	1.00
						(2.72)	(2.13)	(5.11)	(2.93)	
Baseline employment size	25.19	18.70	22.70	19.37	0.59	18.09	11.74	31.75	22.41	0.33
	(15.88)	(11.88)	(18.26)	(12.43)		(30.50)	(13.97)	(48.35)	(45.58)	

	(1) Steel Class + On-site mean	(2) Steel Class-only mean	(3) Steel On-site-only mean	(4) Steel Control mean	(5) Steel (1), (2), (3) v.s. (4) *p*-value	(6) Knitwear Class + On-site mean	(7) Knitwear Class-only mean	(8) Knitwear On-site-only mean	(9) Knitwear Control mean	(10) Knitwear (6), (7), (8) v.s. (9) *p*-value
Baseline sales revenue	31,509	25,757	40,529	26,316	0.67	4,094	2,783	5,697	4,340	0.40
	(23,117)	(29,649)	(39,269)	(20,369)		(3,694)	(3,323)	(7,823)	(7,150)	
Baseline value added	1,876	1,690	2,367	1,744	0.89	1,162	733	1,468	1,438	0.25
	(1,505)	(2,425)	(2,195)	(1,641)		(1,393)	(1,121)	(2,615)	(3,496)	
Joint orthogonality *p*-value					0.54					0.47
No. enterprises in the group	32	76	10	35	153	32	57	16	54	159

Note: Numbers in parentheses are standard deviations. *P*-values are from the *t*-test concerning the null hypothesis that the mean value of the treated three groups are the same as that of the control group. Value added and sales revenue are in terms of million VND (1 million VND is equivalent to 61 USD). Joint orthogonality *p*-values are from the *F*-test concerning the null hypothesis that all the coefficients are zero in the OLS regression with the dummy variable representing the treatment status on the right-hand-side and all the control and outcome variables in the left-hand-side.
Source: Authors' data.

Table 2 presents the means and standard deviations of the control variables (i.e. sample entrepreneurs' characteristics) and the baseline outcome variables by treatment status and cluster. Our outcome variables include the *Kaizen* score, the number of production management practices adopted and represents the basic skills in production management and the overall management score based on 26 questions proposed by McKenzie and Woodruff (2017).[3] The outcome variables also include the employment size in terms of the number of workers and the real annual values of sales revenue and value added, which is defined as sales revenue minus various costs except for labour cost.[4]

Columns 5 and 10 report the *p*-values from the *t*-test for the null hypothesis that the mean values were the same between the control and treatment groups (i.e. Class+Onsite, Class-only, and Onsite-only Groups pooled). To the extent that the *p*-value is insignificant (except for prior training experience in the knitwear cluster and baseline the *Kaizen* score in the steel cluster), the control variables and baseline outcome variables were balanced. In addition, we report the *p*-values from the joint orthogonality test toward the bottom of Table 2. The test concerns the null hypothesis that all the coefficients are zero in an OLS regression with the dummy variable representing the treatment status on the right-hand side and all the control and baseline outcome variables on the left-hand side. The insignificant *p*-values suggest that the assignment of intervention was random.

[3] During our survey, enumerators visited each sample firm and judged whether the firm met each criterion based on either their visual inspection or the entrepreneur's way of responding to their questions. The *Kaizen* score of a firm is the number of the diagnostic criteria that the firm was found to meet, and, hence, the lowest possible value is zero, and the highest is 12. The score should be high if Kaizen was well established. Because *Kaizen* is a common-sense approach, some firms may have adopted some *Kaizen* practices and got relatively high scores without knowing that those practices are part of *Kaizen*.

[4] The data on these baseline values are recall data collected in the baseline survey. For the knitwear firms, the baseline values are the averages of real annual values in 2008 and 2009. The average was taken to reduce noise in the data, following the lead of McKenzie (2012). For the steel firms, the baseline values are the real value of 2009.

3. Results

In this section, we introduce our outcome variables first. We then explain our empirical specification and present the estimated results.

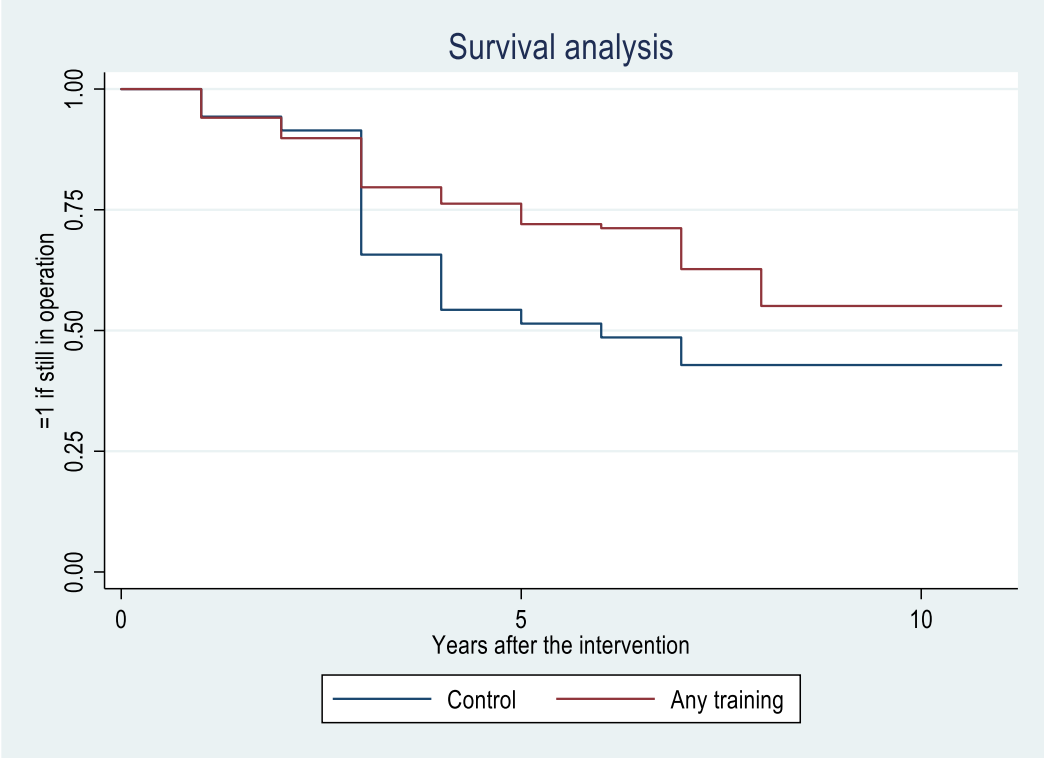
3.1. Outcome Variables

In addition to the outcome variables presented in Panel B of Table 2, our variables of interest include a survival status of the firms. Table 1 shows the number of surviving firms in the parenthesis. As we defined firms as surviving if they had any production in the previous calendar year, all of our sample enterprises were considered as surviving at the time of the 1st follow-up survey in 2011. In the 2nd follow-up survey (conducted in 2013), 25 enterprises in the steel cluster and 12 enterprises in the knitwear cluster had no production in 2012 and thus were considered exit firms. Therefore, the number of surviving enterprises was 128 in the steel cluster and 146 in the knitwear cluster, and the corresponding survival rate was 84% and 92%, respectively. Similarly, the number of surviving firms 5 years after the training intervention was 90 in the steel cluster and 111 in the knitwear cluster, with the corresponding survival rate of 59% and 72%, respectively. In the latest 2021 survey, the number of surviving firms 10 years after the training intervention was 80 in the steel cluster and 92 in the knitwear cluster, with the corresponding survival rate of 54% and 61%, respectively. Note that some enterprises stopped production intermittently, and some of the enterprises that were categorised as exit ones in an earlier survey subsequently resumed operation to be categorised as survived ones.

Figure 1 presents the survival functions of the sample enterprises in each cluster. In both clusters, the survival rates largely diverged in the middle of the figure, i.e. around 4—7 years after the training intervention. Since them, however, the difference narrowed down, and it became almost nil in the knitwear cluster. This illustrates that the training had impacts of firm survival several years after the intervention, but the impact became smaller in the longer run.

Figure 1: Survival Analysis

Panel A1: Steel cluster (control v.s. any training)



Panel A2: Steel cluster (Comparison of each treatment arm)

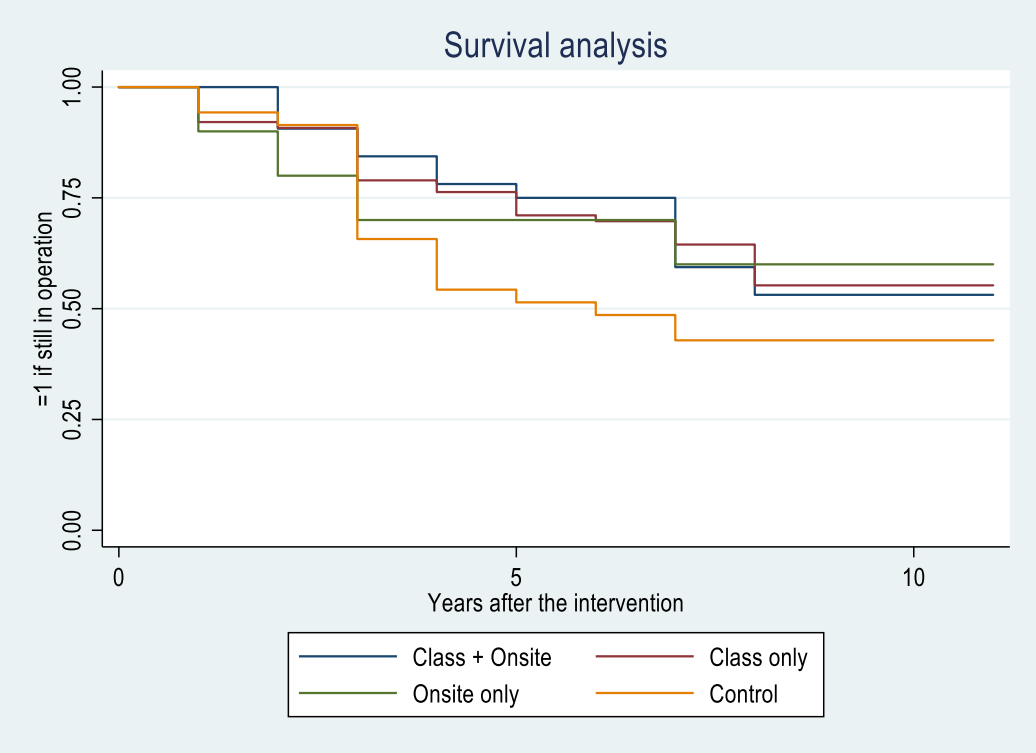
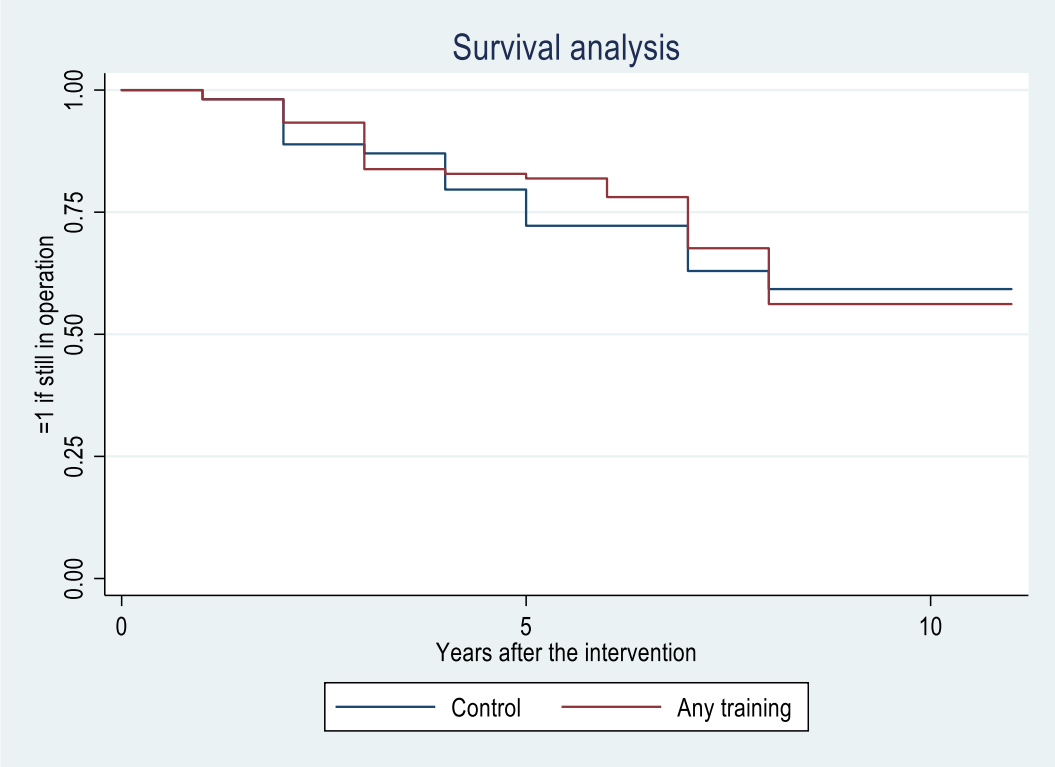
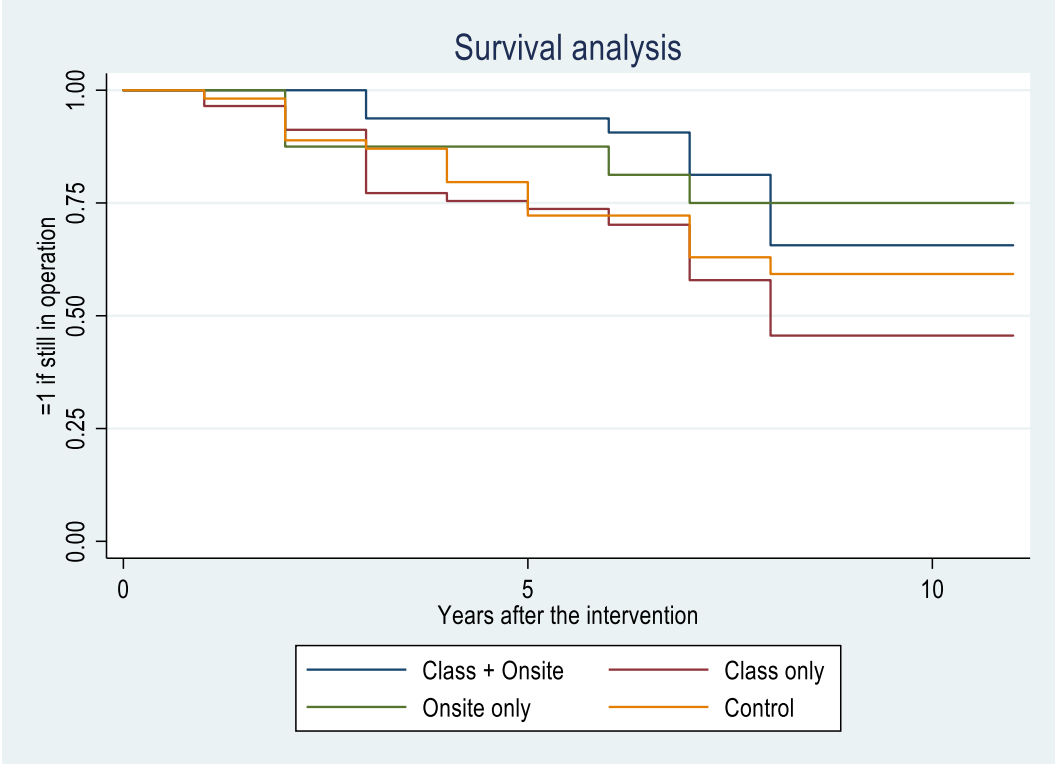


Figure 1: ***Continued***

Panel B1: Knitwear cluster (control v.s. any training)



Panel B2: Knitwear cluster (Comparison of each treatment arm)



Source: Authors' data.

3.2. Empirical Specification

We estimated the impacts of the training on the outcome variables by considering the following regression equation:

$$y_{it} = \alpha + \beta^{BOTH}_{t} Z^{BOTH}_{i} + \beta^{CLASS}_{t} Z^{CLASS}_{i} + \beta^{ONSITE}_{t} Z^{ONSITE}_{i} + y_{i0} + \eta_t + \varepsilon_{it}. \qquad (1)$$

where y_{it} is an outcome variable of firm i at the t-th round of the follow-up survey or year t. Z^{BOTH}_{i} is a dummy variable indicating whether firm i was invited to both components of the training programme (i.e. whether the enterprise belongs to Class+Onsite Group) or not, and similarly, Z^{CLASS}_{i} and Z^{ONSITE}_{i} is a dummy variable indicating whether the enterprise belongs to Classroom-only Group or Onsite-only Group, respectively. Since we expect the training effects to change over time, the coefficients on these variables, β^{BOTH}_{t}, β^{CLASS}_{t}, and β^{ONSITE}_{t} have subscript t. Taking advantage of the perfect compliance of the on-site training and reasonably high compliance rate of the classroom training, we report the estimated coefficients by the intention-to-treat (ITT) specification.[5]

In the estimation of training impacts on business performance (i.e. conditional and unconditional value added), we employed the ANCOVA estimator, which is more efficient than the fixed-effect model estimator, according to McKenzie (2012) and subsequent studies. Specifically, the right-hand side of equation (1) included the baseline value of the dependent variable, y_{i0}. The baseline value in the knitwear cluster was the mean of the values in 2008 and 2009 since the use of average baseline value improves efficiency (see footnote 5). The time effects common to all enterprises, η_t, were captured by time dummy variables and the error term, ε_{it}, was clustered to control for autocorrelation within the respective firms.

3.3. Results

Tables 3 and 4 present the estimation results on management and *Kaizen* scores. In Table 3, we pooled the training, and a firm invited to any component of the training

[5] We estimated the local average treatment effect (LATE) to analyse the training impacts amongst the participants by using random invitation as an instrument for actual training participation (Imbens and Angrist, 1994). Due to non-random self-selection into training, together with the reasonably high compliance rate, we mainly report the ITT results. To preview the comparison between the ITT and the LATE results, the coefficients of the latter tend to be larger in magnitude and the standard errors also tend to be larger, as expected.

programme was considered as a treated firm. The pooling of the intervention increases statistical power. Table 4 presents results that separately estimated the impact of each treatment arm. We found that the training impacts on management were observed until the 4th follow-up survey in both clusters. The impact, however, seemed dissipated in the 5th follow-up survey.

Until the 4th follow-up survey, Table 4 illustrates that particularly the combination of two component worked in both clusters because they have larger coefficients. If we take a closer look, the classroom component had larger impacts than the on-site component in the steel cluster, whereas the on-site training had larger impacts than the classroom component in the knitwear cluster. We interpret that in the steel cluster, where the bulky and heavy machines were used for production, it was not easy for the instructor team to improve the production process of the treated firms in the on-site coaching because it was difficult to change their workshop layout. Instead, conceptual and systematic and knowledge on management and business taught in the classroom training helped the treated firms to apply learned lessons in the long span. On the other hand, the on-site coaching was more effective in the labour-intensive knitwear cluster, where changes in workshop layouts was relatively easy with the help of their workers. The team of instructors provided concrete and tailored advice on how to improve productivity as well as on how to motivate and mobilise the workers.

Note that it was not possible to collect information of adopted management practices from exit firms, and Tables 3 and 4 present the training impacts on management skills only amongst the surviving firms. More poorly managed firms were more likely to exit and better-managed firms over-represent the surviving control firms, and thus, the estimated impact is likely to be a conservative estimate.

Tables 5 and 6 present estimation results on business performance. We used sales revenue and value added as indicators of business performance. The point estimates are basically positive, but only the combination of classroom and on-site training programmes has a significant coefficient. As the training dramatically increased the survival rate, the impacts were stronger on the unconditional value added in which exit enterprises were assumed to have zero value added.

Table 3: Training Impact on Management (ITT)

	Management Score (0–17)			*Kaizen* Score (0–12)		
	Both	**Steel**	**Knitwear**	**Both**	**Steel**	**Knitwear**
Any training * 1st follow-up	1.94***	2.49***	0.49***	1.67***	2.08***	0.46***
	(0.24)	(0.27)	(0.10)	(0.22)	(0.22)	(0.10)
Any training * 2nd follow-up	2.09***	2.75***	0.78***	2.10***	2.75***	0.87***
	(0.23)	(0.24)	(0.25)	(0.21)	(0.24)	(0.21)
Any training * 3rd follow-up	5.06***	6.27***	3.39***	3.40***	4.31***	2.54***
	(0.44)	(0.56)	(0.68)	(0.31)	(0.42)	(0.40)
Any training * 4th follow-up	4.76***	6.49***	2.36***	3.01***	4.10***	1.65**
	(0.49)	(0.61)	(0.84)	(0.37)	(0.43)	(0.74)
Any training * 5th follow-up	–0.19	0.68	–0.52	–0.39	0.37	–0.39
	(0.54)	(0.63)	(0.83)	(0.46)	(0.53)	(0.72)
2nd follow-up	–1.03***	–0.71***	–1.50***	–0.24**	0.052	–0.65***
	(0.13)	(0.12)	(0.21)	(0.11)	(0.076)	(0.19)
3rd follow-up	–4.45***	–3.43***	–5.82***	–2.63***	–1.32***	–4.69***
	(0.29)	(0.29)	(0.53)	(0.26)	(0.24)	(0.27)
4th follow-up	–3.73***	–2.86***	–4.72***	–2.07***	–1.00***	–3.54***
	(0.36)	(0.36)	(0.78)	(0.32)	(0.28)	(0.71)
5th follow-up	1.79***	3.54***	–1.21*	1.97***	3.83***	–1.25*
	(0.51)	(0.57)	(0.72)	(0.47)	(0.47)	(0.64)
Baseline score	0.73***	0.62***	0.92***	0.74***	0.70***	0.82***
	(0.054)	(0.069)	(0.074)	(0.043)	(0.060)	(0.061)
Steel cluster	–2.84***			–2.53***		
	(0.27)			(0.22)		
N	1142	607	535	1142	607	535

Note: Estimated coefficients are reported. ***, **, and * indicate the 1%, 5%, and 10% levels of statistical significance, respectively. Numbers in parentheses are standard errors clustered at the enterprise level.
Source: Authors' data.

Table 4: Training Impact on Management (ITT)

	Management score (0–17)			*Kaizen* score (0–12)		
	Both	**Steel**	**Knitwear**	**Both**	**Steel**	**Knitwear**
Class+Onsite * 1st follow-up	3.25***	4.19***	1.58***	2.78***	3.48***	1.54***
	(0.27)	(0.40)	(0.24)	(0.23)	(0.31)	(0.24)
Class+Onsite * 2nd follow-up	3.63***	4.59***	1.98***	3.64***	4.55***	2.15***
	(0.23)	(0.25)	(0.32)	(0.22)	(0.23)	(0.29)
Class+Onsite * 3rd follow-up	7.79***	8.55***	6.39***	5.34***	5.90***	4.69***
	(0.49)	(0.66)	(0.74)	(0.39)	(0.52)	(0.50)
Class+Onsite * 4th follow-up	7.35***	9.00***	4.66***	4.86***	5.79***	3.51***
	(0.55)	(0.66)	(0.90)	(0.41)	(0.46)	(0.79)
Class+Onsite * 5th follow-up	0.27	1.56**	–1.23	0.024	1.12	–0.93
	(0.72)	(0.75)	(1.05)	(0.65)	(0.68)	(0.91)
Class-only * 1st follow-up	0.35	–0.15	–0.091	0.31	–0.14	–0.087
	(0.23)	(0.30)	(0.11)	(0.21)	(0.25)	(0.11)
Class-only * 2nd follow-up	1.18***	1.46***	0.26	1.16***	1.38***	0.30
	(0.22)	(0.27)	(0.22)	(0.22)	(0.26)	(0.18)
Class-only * 3rd follow-up	3.32***	4.56***	2.05***	2.20***	3.33***	1.58***
	(0.55)	(0.85)	(0.74)	(0.40)	(0.63)	(0.42)
Class-only * 4th follow-up	3.11***	4.53***	1.46*	1.92***	3.08***	0.90
	(0.57)	(0.91)	(0.87)	(0.43)	(0.64)	(0.75)
Class-only * 5th follow-up	–0.62	0.055	–0.30	–0.78	–0.087	–0.21
	(0.60)	(0.72)	(0.91)	(0.51)	(0.60)	(0.77)
Onsite-only * 1st follow-up	2.45***	3.41***	1.00*	2.70***	3.67***	0.97**
	(0.37)	(0.41)	(0.57)	(0.27)	(0.30)	(0.47)
Onsite-only * 2nd follow-up	5.05***	5.82***	3.43***	3.25***	3.49***	2.64**

	Management score (0–17)			*Kaizen* score (0–12)		
	Both	**Steel**	**Knitwear**	**Both**	**Steel**	**Knitwear**
	(0.62)	(0.65)	(1.30)	(0.49)	(0.46)	(1.16)
Onsite-only * 3rd follow-up	4.99***	6.40***	1.86	2.80***	3.32***	1.51
	(0.80)	(0.84)	(1.46)	(0.51)	(0.49)	(1.21)
Onsite-only * 4th follow-up	0.25	0.47	0.18	0.023	–0.0027	0.23
	(0.74)	(0.86)	(1.30)	(0.61)	(0.64)	(1.04)
Onsite-only * 5th follow-up	0.66***	0.60***	0.82***	0.67***	0.71***	0.72***
	(0.054)	(0.073)	(0.080)	(0.043)	(0.066)	(0.063)
Baseline score	–2.38***			–2.09***		
	(0.25)			(0.22)		
Steel cluster	3.25***	4.19***	1.58***	2.78***	3.48***	1.54***
	(0.27)	(0.40)	(0.24)	(0.23)	(0.31)	(0.24)
N	1142	607	535	1142	607	535

Note: Estimated coefficients are reported. ***, **, and * indicate the 1%, 5%, and 10% levels of statistical significance, respectively. Numbers in parentheses are standard errors clustered at the enterprise level. Survey round dummies are controlled in the regression, but their coefficients are not reported.

Source: Authors' data.

Table 5: Training Impact on Business Performance (ITT)

	Sales Revenue			Value Added		
	Both	**Steel**	**Knitwear**	**Both**	**Steel**	**Knitwear**
Any training * 2010	2467.5**	249.2	2129.1	791.7**	320.6	698.4
	(1090.1)	(492.8)	(1830.2)	(340.3)	(314.8)	(434.3)
Any training * 2012	123.0	1831.8	169.3	646.2	942.0*	58.0
	(2152.8)	(1157.6)	(4504.2)	(451.0)	(515.8)	(568.6)
Any training * 2015	–1123.0	587.8	911.1	1699.9	640.5	4982.3*
	(3016.6)	(1950.3)	(8056.2)	(1353.9)	(1550.2)	(2896.8)
Any training * 2016	3400.1	1874.0	3571.6	2114.8***	534.9	3218.0**
	(3276.8)	(1274.1)	(9418.0)	(756.4)	(731.0)	(1376.7)
Any training * 2019	2430.8	–1599.5	5566.8	752.4	–175.0	2382.3
	(4709.8)	(2896.2)	(10585.1)	(1901.0)	(2326.5)	(2620.9)
Any training * 2020	–2616.5	–802.8	–5663.9	–786.5	108.3	–940.6
	(5108.4)	(2748.6)	(14110.4)	(1587.0)	(2180.6)	(2227.3)
2012	–7468.0***	–1528.0*	–16632.8***	–877.5***	–590.5**	–1320.2***
	(1754.3)	(880.7)	(3774.1)	(193.1)	(231.2)	(327.5)
2015	–6061.1**	294.1	–18170.7**	–1080.0	830.5	–5803.9**
	(2656.8)	(1438.7)	(7387.3)	(1239.7)	(1122.7)	(2847.6)
2016	–3770.4	–1100.9	–7111.2	520.3	459.9	458.3
	(2674.4)	(1010.4)	(8573.1)	(581.6)	(592.2)	(1033.5)
2019	618.0	3512.1*	–3611.9	2248.7*	2989.0*	292.5
	(2817.0)	(2015.5)	(7526.0)	(1188.9)	(1545.9)	(1425.0)
2020	–320.4	1856.1	–3012.8	1525.7	2158.8	–200.4
	(4578.3)	(2063.6)	(13572.2)	(1256.2)	(1597.1)	(1669.9)
Baseline score	1.26***	0.96***	1.27***	1.54***	0.96	2.11***
	(0.19)	(0.30)	(0.20)	(0.46)	(0.60)	(0.23)
Steel cluster	–1707.3			384.3		
	(4340.7)			(653.1)		
N	1357	713	644	1357	713	644

Note: Estimated coefficients are reported. ***, **, and * indicate the 1%, 5%, and 10% levels of statistical significance, respectively. Numbers in parentheses are standard errors clustered at the enterprise level.
Source: Authors' data.

Table 6: Training Impact on Business Performance (ITT)

	Sales Revenue			Value Added		
	Both	**Steel**	**Knitwear**	**Both**	**Steel**	**Knitwear**
Class+Onsite * 2010	1994.5	264.8	1440.0	758.3*	204.8	858.0
	(1729.6)	(538.3)	(3151.4)	(428.3)	(347.4)	(567.0)
Class+Onsite * 2012	–90.8	1313.1	–221.3	674.8	914.0*	168.9
	(2908.4)	(1149.4)	(6082.4)	(527.8)	(501.9)	(786.1)
Class+Onsite * 2015	–1499.0	1429.3	–2182.6	2241.9	1844.6	4768.2
	(3753.3)	(2926.8)	(9149.1)	(1845.9)	(2609.3)	(3083.4)
Class+Onsite * 2016	8548.5*	2193.6	14886.2	3521.1***	623.1	6844.1***
	(4381.7)	(1552.3)	(11276.5)	(1012.7)	(804.2)	(1738.1)
Class+Onsite * 2019	–2937.8	–1284.7	–5353.6	–131.7	–256.8	867.1
	(4068.1)	(2761.4)	(9693.1)	(1603.2)	(1970.7)	(2404.2)
Class+Onsite * 2020	–6377.3	–311.1	–14678.6	–728.2	104.9	–960.5
	(5556.7)	(2815.8)	(14969.6)	(1803.0)	(2025.2)	(2944.5)
Class-only * 2010	2516.5*	475.9	679.4	390.1	310.4	–176.6
	(1413.7)	(670.9)	(2278.8)	(337.0)	(420.9)	(457.0)
Class-only * 2012	1175.6	923.3	3130.6	561.7	608.1	205.7
	(2390.5)	(994.6)	(4746.0)	(436.2)	(466.6)	(563.2)
Class-only * 2015	–1253.8	–312.0	2461.8	1271.4	–464.6	5100.0*
	(3491.3)	(1685.5)	(8558.2)	(1292.2)	(1247.2)	(2937.7)
Class-only * 2016	1135.6	1435.4	–755.5	1309.2	53.8	1578.2
	(3873.0)	(1269.5)	(9944.9)	(857.3)	(706.7)	(1430.7)
Class-only * 2019	5110.5	–3739.1	10141.5	697.8	–2067.7	3317.2
	(6756.7)	(2342.9)	(12936.5)	(2430.9)	(1697.1)	(3483.3)
Class-only * 2020	–1773.3	–2276.0	–3304.1	–2033.3	–1359.9	–1837.7
	(5247.8)	(2380.4)	(14197.9)	(1520.1)	(1758.1)	(2453.4)
Onsite-only * 2010	–4630.1	5973.6*	–21344.4	840.4	2044.4**	–1424.0
	(6945.2)	(3163.7)	(15622.5)	(802.4)	(938.1)	(1461.5)

	Sales Revenue			Value Added		
	Both	**Steel**	**Knitwear**	**Both**	**Steel**	**Knitwear**
Onsite-only * 2012	585.5	936.2	595.7	1892.4	880.0	4867.8*
	(4745.0)	(2844.7)	(14313.2)	(1580.5)	(1969.9)	(2939.9)
Onsite-only * 2015	370.2	2189.6	–3199.4	1789.7	1499.1	3027.5*
	(3769.1)	(1888.2)	(11728.6)	(1087.0)	(1207.5)	(1822.1)
Onsite-only * 2016	3601.3	3014.2	5878.2	2669.8	4532.6	358.4
	(10037.6)	(8157.9)	(24734.0)	(4869.7)	(7587.9)	(2693.2)
Onsite-only * 2019	2400.5	1853.1	4382.4	3849.1	3631.2	5318.9
	(10627.2)	(6654.0)	(28336.6)	(4362.9)	(6163.2)	(5924.4)
Onsite-only * 2020	1.26***	0.93***	1.28***	1.53***	0.91	2.12***
	(0.19)	(0.28)	(0.19)	(0.46)	(0.56)	(0.23)
Baseline score	–1901.7			515.5		
	(4545.6)			(622.2)		
Steel cluster	1994.5	264.8	1440.0	758.3*	204.8	858.0
	(1729.6)	(538.3)	(3151.4)	(428.3)	(347.4)	(567.0)
N	1357	713	644	1357	713	644

Note: Estimated coefficients are reported. ***, **, and * indicate the 1%, 5%, and 10% levels of statistical significance, respectively. Numbers in parentheses are standard errors clustered at the enterprise level. Year dummies are controlled in the regression, but their coefficients are not reported.
Source: Authors' data.

4. Conclusion

The management capacity of entrepreneurs is an important determinant of productivity for SMEs, especially in developing economies. Compared with those economies nearer to technological frontiers, developing economies have more abundant opportunities for technology borrowing or imitation of technologies developed in frontier economies. To effectively borrow technologies or carry out imitation, managers and workers need to be willing and able to learn new skills and adapt to new work practices. Whether appropriate motivation can be given to them depends largely on the entrepreneur's management capacity. This holds true to some extent for large firms, but more so for SMEs as their major decisions are mostly made by entrepreneurs.

This study has taken advantage of the randomised design of training intervention and the panel data covering 10 years to analyse the longer-term impact of management training. It uses the newly collected original 10-year panel data to analyse the long-term training impacts on their productivity and other aspects of their business. This paper has found that the *Kaizen* training had favourable effects on management practices, and that these effects lasted at least for 5 years. We believe that this paper helps policymakers discuss and design appropriate policies to support firms and productivity growth in Viet Nam and other developing economies.

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Appendices

Appendix Table 1: *Kaizen* Score

Evaluation based on the enumerators' observations
The enterprise has a designated area for each production/activity within the workshop.
The enterprise has a fixed place where major tools are stored.
The storage of tools is put in order by kind.
The enterprise has a fixed place where raw materials are stored.
The raw materials are stored separately from the scrap.
The work flow line is determined.
The defectives of raw materials and finished products are clearly segregated from the good ones.
Evaluation based on the owners' responses
The scraps are removed and the floor is cleaned every day.
The workers maintain machines every day.
The enterprise holds meeting in which all workers participate.
The proprietor knows how long each production process takes.

Source: Authors' data.

Appendix Table 2: Pairwise Balance Check

	(1) Steel Class + Onsite v.s. Class-only *p*-value	(2) Steel Class + Onsite v.s. Onsite-only *p*-value	(3) Steel Class + On-site v.s. Control *p*-value	(4) Steel Class-only v.s. Onsite-only *p*-value	(5) Steel Class-only v.s. Control *p*-value	(6) Steel Onsite-only v.s. Control *p*-value	(7) Knit-wear Class + Onsite v.s. Class-only *p*-value	(8) Knit-wear Class + Onsite v.s. Onsite-only *p*-value	(9) Knit-wear Class + On-site v.s. Control *p*-value	(10) Knit-wear Class-only v.s. Onsite-only *p*-value	(11) Knit-wear Class-only v.s. Control *p*-value	(12) Knit-wear Onsite-only v.s. Control *p*-value
Panel A: Control variable												
Age (as of the baseline)	0.28	0.54	0.21	0.98	0.66	0.78	0.85	0.55	0.86	0.48	1.00	0.54
Male (yes = 1)	0.74	0.87	0.41	0.70	0.18	0.70	0.19	0.29	0.51	0.91	0.46	0.54
Years of education	0.97	0.56	0.63	0.51	0.51	0.40	0.70	0.29	0.25	0.45	0.37	0.89
Training experience (yes = 1)	0.53	0.39	0.95	0.09	0.57	0.35	0.84	0.44	0.12	0.30	0.14	0.02
Panel B: Outcome variable												
Baseline *Kaizen* score (0–11)	0.04	0.25	0.00	0.95	0.12	0.45	0.87	0.10	0.43	0.05	0.37	0.14
Baseline management score	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	0.43	0.07	0.90	0.01	0.32	0.06
Baseline employment size	0.02	0.68	0.10	0.35	0.78	0.51	0.02	0.24	0.64	0.01	0.10	0.48

	(1) Steel Class + Onsite v.s. Class-only *p*-value	(2) Steel Class + Onsite v.s. Onsite-only *p*-value	(3) Steel Class + On-site v.s. Control *p*-value	(4) Steel Class-only v.s. Onsite-only *p*-value	(5) Steel Class-only v.s. Control *p*-value	(6) Steel Onsite-only v.s. Control *p*-value	(7) Knit-wear Class + Onsite v.s. Class-only *p*-value	(8) Knit-wear Class + Onsite v.s. Onsite-only *p*-value	(9) Knit-wear Class + On-site v.s. Control *p*-value	(10) Knit-wear Class-only v.s. Onsite-only *p*-value	(11) Knit-wear Class-only v.s. Control *p*-value	(12) Knit-wear Onsite-only v.s. Control *p*-value
Baseline sales revenue	0.33	0.37	0.33	0.16	0.92	0.13	0.18	0.34	0.82	0.03	0.13	0.53
Baseline value added	0.69	0.43	0.73	0.40	0.90	0.33	0.12	0.60	0.67	0.10	0.15	0.97
Joint orthogonality *p*-value	0.22	0.11	0.01	0.46	0.69	0.70	0.72	0.85	0.78	0.17	0.54	0.30

Note: *P*-values are from the *t*-test concerning the null hypothesis that the mean values are the same amongst the two groups. Value added and sales revenue are in terms of million VND (1 million VND is equivalent to 61 USD). Joint orthogonality *p*-values are from the *F*-test concerning the null hypothesis that all the coefficients are zero in the OLS regression with the dummy variable representing the treatment status on the right-hand-side and all the control and outcome variables in the left-hand-side.

Source: Authors' data.

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