Management skill, entrepreneurial motivation, and enterprise survival: Evidence from randomized experiments and repeated surveys in Vietnam

Yuki Higuchi[a], Vu Hoang Nam[b], and Tetsushi Sonobe[c]

a. *Nagoya City University, Nagoya, Japan*
b. *Foreign Trade University, Hanoi, Vietnam*
c. *National Graduate Institute for Policy Studies, Tokyo, Japan*

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Abstract

We conducted randomized experiments to provide management training for 312 Vietnamese small manufacturers in 2010 and repeatedly collected follow-up data in 2011, 2013, and 2016. Analyzing panel data constructed from our surveys with negligible incidence of attrition (less than 2 percent of the baseline sample), we find that the treated enterprises were 17 percentage points more likely to continue business five years after the training, when a five-year survival rate among the control group was 52 percent. In addition, the treated enterprises, particularly a sub-group that received both classroom and on-site training programs, had significantly higher business performance than the control group. Mediation analysis suggests that the higher business performance was due to sustainably improved management skill and entrepreneurial motivation.

Keywords: Management training, *Kaizen*, Small and medium enterprises, Vietnam, Asia
JEL classification: L2, M1, O1

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I. Introduction

The management score developed by Bloom and van Reenen (2007) and subsequent studies and several randomized controlled trials (RCTs) of management training have confirmed a long-standing suspicion that management tends to be poor in developing countries. Hence, a question arises as to whether improvement in management practices increases business performance. In a survey of RCTs of management training, McKenzie and Woodruff (2014) pointed out that evidence on this issue has so far been weak. Few studies found statistically significant impacts of experimental training programs on business performance of treated firms, and researchers are yet to arrive at a consensus on why training impacts on business are limited. Are they due to inadequately designed training programs, too early assessment of training impacts, or knowledge spillovers form training participants to non-participants?

This study attempts at providing a partial answer, particularly to a question of whether training impact on business performance dissipates or enhances over time, based on RCTs of management training that we conducted in Vietnam. Our previous studies (Higuchi, Nam et al. 2015; Higuchi, Mhede et al. 2016) found that training impact on value added emerged over time, suggesting that training impact in the existing studies is evaluated too soon. In this paper, we further extend the follow-up observation period to evaluate training impact over five years.

We conducted a baseline survey of 312 small manufacturers in two industrial clusters in the suburbs of Hanoi, Vietnam, in early 2010, and then assigned them randomly to treatment and control groups. Our training program had classroom and on-site components. Classroom training participants learned from trainers about good

management practices for about 40 hours in total. On-site training participants had the trainers visited their workshops several times and received concrete advice on how to improve efficiency and safety at work. Follow-up surveys were conducted in 2011, 2013, and 2016 to collect data of management practices at that point in time as well as annual values of production and costs in the previous calendar year.

Based on panel data constructed by our surveys, we found that three treatment groups (i.e. those invited to either component or to both training components) were on average 17 percentage points more likely to continue business five years after the intervention, when a five-year survival rate among the control group was 52 percent. This was not influenced by systematic attrition from the survey because we tracked almost all the sample enterprises including the exit ones and the incidence of attrition at the latest survey in 2016 was less than 2% of the baseline sample. In addition, we found that the treated enterprises, particularly a sub-group that received both classroom and on-site training programs, had significantly higher business performance, measured in terms of value added, sales revenue or profit, than the control group in the five-year interval.

In order to analyze the mechanism linking the training and business performance, we conduct mediation analysis, which has been recently developed and increasingly applied in empirical studies (e.g., Dippel et al. 2017; Hicks and Tingley 2011; Imai et al. 2011). As a result, we found that the higher business performance was due to sustainably improved management skill and entrepreneurial motivation. The treated enterprises applied a significantly greater number of good management practices soon after the training, which is consistent with the existing studies, and more importantly, they continued to adopt more management practices than the control group five years after the intervention. In addition, they had significantly higher entrepreneurial motivation score,

which was constructed based on a number of questions, such as, whether they wish to learn new business knowledge or whether they are confident in introducing new product. Our data suggests that the entrepreneurial score was indeed correlated with the real-world behaviour, such as, participation in management training (after our training) and product upgrading.

This paper contributes to four strands of literature. Firstly, we provided evidence on longer-term impact of management training, which was pointed out as one of the important remaining questions in the literature of management training (McKenzie and Woodruff, 2014). Consistent with a non-experimental evidence by Giorcelli (2016) finding the positive training impacts fifteen years after the training, which targeted for medium to large enterprises in Italy as part of the Marshall Plan, our experiment revealed that management training can have longer-term impacts on small enterprises in today's emerging economy. Second, this paper sheds light on the mechanism through which training intervention increases business performance, with particular focus on entrepreneurial motivation. Our findings support a small but emerging literature on the importance of motivational aspect in business success (e.g., Bruhn et al. 2017; Lafortune et al. 2016).

Thirdly, our study contributes to an established literature on enterprise survival (e.g., Dunne et al. 1989; Evans 1987). In the empirical studies following these early theoretical papers, the main explanatory variables of enterprise survival included enterprise size, age, and human capital of entrepreneurs. We argue that management also matters in enterprise survival because we found that managerial intervention helped the treated enterprises to survive. Fourthly, this paper contributes to an emerging literature of identification of gazelles, that is, enterprises with high growth potential (Diao et al. 2016; Fafchamps and

Woodruff 2016; Grimm et al. 2012; McKenzie 2017). The identification of gazelles is an important policy agenda for allocating business resource to promising enterprises. Based on our finding that enterprises selectively decided to participate in the training (the compliance rate for classroom component was 47%) and that the training participants indeed performed better in the five-year interval, we argue that provision of management training can be used as a screening device for identifying high-performing enterprises.

The remainder of the paper is organized as follows. Section 2 describes the experimental design and checks balance. Section 3 describes the empirical strategy and presents the impact evaluation results while Section 4 summarizes the findings and discusses implications for future studies.

II. Experimental Design

Study Sites and Sample Enterprises

Since our ultimate goal is to prescribe an effective policy toward income generation 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. 2016; 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 enterprises face same prices of product, factors, and intermediate inputs, and have same access to infrastructure because they produce same products in geographical proximity. This reduces heterogeneity among sample firms, thereby facilitating statistical inference.

A major disadvantage is that imitation is rampant in industrial clusters. Management practices and business performance might improve for even those firms that did not receive training, which would lead to an underestimation of training impacts unless a special method of impact evaluation, such as one adopted by McKenzie and Puerto (2017) for a large number of microenterprises is applied. Having said that knowledge spillovers make impact evaluation difficult, we note that spillovers make social benefit of the training greater than private benefit. Although there is suggestive evidence for existence of the spillovers in our context, we have not applied any special method, and hence, our results are likely to understate the training impacts.

The two industrial clusters in our study are selected from over two thousand village industrial clusters throughout Vietnam which have spontaneously developed and produced traditional craft items (JICA 2004)[1]. These clusters have contributed to rapid economic growth since 1986 when Vietnamese economy was liberalized by Doi Moi (Renovation) policy (Oostendorp et al. 2009). In 2007, Nam et al. (2009; 2010) conducted enterprise surveys in two of these clusters that have successfully started producing modernized items. We chose the two clusters as our experiment sites partly because of existing rapport, and partly because they were representative clusters of modern products in semi-urbanized areas in Vietnam in terms of 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 center but in different directions: one cluster in Bac Ninh province has produced steel products and the other in Ha Tay province has produced knitwear and garment products. In the steel cluster, Nam et al. (2009) surveyed 204 enterprises randomly selected from

[1] See Higuchi et al. (2015) for more detail description of the two industrial clusters in our study.

372 enterprises that were in a list provided by the commune government office in 2007, and we found that, among the 204 enterprises, 155 were still in operation before the training intervention in 2010. This 155 enterprises consist our baseline sample steel manufacturers in this study. In the knitwear cluster, Nam et al. (2010) surveyed a total of 138 enterprises in operation in 2007, even though the collected data were lost due to an accident in late 2008. According to a new list complied in 2010 by the commune government office, the total number of knitwear enterprises was 161, all of which consist our baseline sample knitwear manufacturers. Just before our management training programs started in 2010, baseline surveys were conducted in the two clusters.

Experimental Intervention and Timeline

A typical sample enterprise under our study employs about 20 workers. When a firm has no employees, what business owner/managers must know about management would be their self-management, financial management, and marketing. When a firm has many employees, they need to know how to coordinate the division of labor as well. Thus, our experimental training programs covered not only basic accounting, marketing, and business strategy as often adopted in the existing studies (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 among workers (Imai 2012). We made a contract with a business consulting firm in Japan to dispatch a *Kaizen* expert to our study sites. We also hired a local consultant, who was 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 in the local language the training participants.

Bloom et al. (2013) found that an extensive training program featuring lean manufacturing, an American version of *Kaizen*, was effective in improving management practices and productivity at medium-sized textile plants in India. It remains an open question whether less expensive, shorter-term training programs can have favorable and sustained impacts on small-sized enterprises.

In the two clusters, the training programs had two components: one offered classroom lectures for 2.5 hours a day, five days a week over a three-week span (total about 40 hours), and the other sent trainers to participants several times to provide coaching tailored 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 among the classroom training participants, the team of instructors selected two enterprises in each cluster to make them model enterprises, which served as showcases of *Kaizen* practices. At the selected four enterprises, 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 only half was invited to the on-site training component. On-site training began with a one-day seminar, in which the model enterprise owner/managers gave presentations about their enterprises' physical changes and the responses from their workers as well as their own opinions. After the seminar, the instructor team visited each participants' enterprises 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 enterprises were not randomly selected as they were required to be willing to showcase their changed workshop and to have enough space to welcome on-site training

participants to observe the changes, we exclude these enterprises from the empirical analyses below.

The two training programs were implemented in 2010, and an interim survey was conducted after the classroom training but before the on-site training. After the completion of the on-site training program, three follow-up surveys were conducted from early 2011 through early 2016. Timeline of the training programs and surveys is presented in Table 1, and the latest follow-up survey allows us to evaluate training impacts five years after the intervention.

Randomization and Balance

We group the total of 312 baseline samples (153 in the steel cluster and 159 in the knitwear cluster after excluding the four model enterprises) into three treatment groups and a control group. The first treatment group was invited to both classroom and on-site training programs and labeled as "Class + Onsite" Group, while the second and third were invited only to either the classroom or the on-site program and labeled "Class-only" group and "Onsite-only" Group, respectively. "Control" Group was invited to neither of the programs. The sample size of each group is shown in 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 and invited randomly selected enterprises from both strata to the on-site training. Given the budget constraint and limited number of enterprises to be selected as on-site training recipients, we assigned a larger share to the stratum that were invited to the classroom training so that we can have a certain

number of enterprises who would receive both components of the training. Hence, the number of enterprises in "Onsite-only" Group is particularly small.

While 108 enterprises in the steel cluster were invited to the classroom training program, only 41 enterprises actually participated. In the knitwear cluster, 89 enterprises were invited, and only 52 enterprises actually participated. We issued a certificate to the enterprises that participated for at least ten days of the classroom training out of the total 15 days. We define only the certificate holders as classroom training participants. The take-up rate was 38 percent and 58 percent in the steel and knitwear clusters, respectively. By contrast, the take-up rate of the on-site training was 100 percent in both clusters because no enterprise refused to accept the consultants' visits. There were no uninvited participants in any training program.

Table 2 presents the means and standard deviations of control variables (i.e., sample owner/managers' characteristics) and baseline outcome variables by treatment status and by cluster. Our outcome variables include *Kaizen* score, which is the number of production management practices adopted and represents the basic skills in production management (see Panel A in Appendix Table 1 for all 11 diagnostic criteria on which the score is based)[2], overall management score similar to the one developed by McKenzie and Woodruff (2016)[3], employment size in terms of the number of workers, and real

[2] During our survey, enumerators visited each sample enterprise and judged whether the enterprise met each criterion based on either the enumerators' visual inspection or the owner's way of responding to their questions. The *Kaizen* score of an enterprise is the number of the diagnostic criteria that the enterprise was found to meet, and, hence, the lowest possible value is zero and the highest is 11. The score should be high if *Kaizen* is well established. Because *Kaizen* is a common-sense approach, some enterprises may have adopted some *Kaizen* practices and get somewhat relatively high scores without knowing that those practices are part of *Kaizen*. In the steel cluster, the baseline *Kaizen* score was collected at the time of interim survey due to time constraint which enabled us to conduct only a short baseline survey. In the interim survey, we collected information of their production management practices at the time of the interim survey as well as retrospective information on the practices adopted before the classroom training.

[3] Note that the diagnostic criteria was changed in the 3rd follow-up survey. In the 3rd follow-up survey, we strictly followed McKenzie and Woodruff (2016) and asked 26 questions to elicit the number of adopted questions. In the baseline, 1nd, and 2nd follow-up surveys, the score ranges from 0 to 30 while it ranges

annual values of sales revenue and value added, which is defined as sales revenue minus various costs except for labor cost.[4]

Columns 5 and 10 report *p*-values from the *t*-test for the null hypothesis that the mean values are the same between the control group and the treatment groups (i.e., Class+Onsite, Class-only, and Onsite-only Groups pooled). To the extent that *p*-value is insignificant (except for prior training experience in the knitwear cluster and baseline *Kaizen* score in the steel cluster)[5], control variables and baseline outcome variables are balanced. See Appendix Table 2 for the *p*-values from pairwise comparison of all the possible pairs among the four groups. In addition, *p*-values from the joint orthogonality test, which is from *F*-test concerning 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 in the left-hand-side, are reported toward the bottom of Table 2 (see Appendix Table 2 for corresponding *p*-values for the pairwise comparison). The insignificant *p*-values suggest that the assignment of intervention was random.

III. Results

from 0 to 26 in the 3rd follow-up survey. The correlation coefficient of the original management score in the 2nd follow-up survey and the score based on McKenzie and Woodruff (2016) in the 3rd follow-up survey was 0.74. In the steel cluster, due to the reasons described in Footnote 3, we did not collect overall management score in the baseline survey (see Table 2).

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

[5] As described in Footnote 3, the baseline *Kaizen* score in the steel cluster was retrospectively collected at the time of the interim survey. The score of the treatment group may have been over-reported, referencing the improved production management practices after the classroom training. Such bias of "shoestring" retrospective data collection was reported by Ravallion (2014).

Outcome Variables

In addition to the outcome variables presented in Panel B of Table 2, our variables of interest include a survival dummy and an entrepreneurial spirit score. Table 1 shows the number of surviving enterprises in the parenthesis. As we define enterprises 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 1st follow-up survey. In the 2nd follow-up survey, 25 enterprises in the steel cluster and 13 enterprises in the knitwear cluster had no production in 2012 and thus were considered exit enterprises. 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%. Similarly, 64 steel enterprises and 46 knitwear enterprises had no production in 2015 and thus are defined as exit ones. The number of surviving enterprises five years after the training intervention was 89 in the steel cluster and 108 in the knitwear cluster, with the corresponding survival rate of 58% and 68%. Note that a few enterprises that had no production in 2012 re-started the production by 2015, and thus, were defined as exit in the 2nd follow-up survey while as surviving at the 3rd follow-up survey.

Table 3 shows the number of survival enterprises and survival rate by the treatment status and by cluster in the same manner as Table 2. The survival rate of enterprises in Class+Onsite Group at the 3rd follow-up survey was 66% and 88% in the steel and knitwear cluster, respectively, whereas the corresponding survival rate among the control Group was 37% and 59%. These differences suggest that the training intervention had positive impacts on enterprise survival. Due to the differential survival rates, we analyze the training impacts on business performance which is conditional on survival as well as that on unconditional business performance by assuming that exit enterprises had zero

zero value added.

In order to examine mechanism linking the training intervention and business performance, we analyze managerial skills and entrepreneurial spirit. Managerial skills were measured using *Kaizen* and overall management scores as described in Section II. In the survey of management training by McKenzie and Woodruff (2014), most of the existing training interventions improved management skills of the treated enterprises although only a few studies found positive impacts on business performance. Hence, the training impacts on business performance, if any, are most likely to be due to improved management skills.

In addition, a number of recent studies have found that entrepreneurial spirit is important determinant of business success. For instance, Lafortune et al. (2016) found that a motivational intervention, that was to set one-hour meeting with a successful entrepreneur, had similar magnitude of impacts as business consultation for a few hours on self-employment rate and income among Chilean microenterprises. Hence, we examine entrepreneurial spirit as a possible channel through which our training intervention influenced business performance. In order to quantify entrepreneurial spirit, we constructed an entrepreneurial score, which is based on seven criteria listed in Panel B of Appendix Table 1.[6] The score is based on both hypothetical questions about their attitude and questions about their actual behavior in business. Admitting that some questions are sorely hypothetical, the score seems to be a reasonable proxy for

[6] We have to note that most of these questions were newly added in the 3rd follow-up survey, and thus, the score at the time of the 1st follow-up survey was sorely based on whether "The entrepreneur is definitely sure to willing to learn business/management." This information collected using certainty approach, however, was proved to provide credible information on the attitude of respondents. We followed Blumenschein et al. (2008) to ask a hypothetical question, followed by a question to ask whether the answer was "definitely or probably sure." The definitely sure answers were found to reasonably predict real-world behavior.

entrepreneurial spirit because hypothetical questions are good predictor of real world behavior. For instance, "The entrepreneur is definitely sure to willing to learn business/management" is a good predictor of "The entrepreneur actually participated in business/management training between 2011 and 2015."

Empirical Specification

We first estimate the reduced-form impacts of the training on the outcome variables by considering the following regression equation:

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

where y_{it} is an outcome variable of enterprise i at the t-th round of the follow-up survey or year t. Z^{BOTH}_{i} is a dummy variable indicating whether enterprise i was invited to both components of the training program (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 mainly report the estimated coefficients by the intention-to-treat (ITT) specification.

In the estimation of training impacts on business performance (i.e., conditional and unconditional value added), we employ 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) includes the baseline value of the dependent variable, y_{i0}. The baseline value in the knitwear cluster is the mean of the values in 2008 and 2009 since the use of average baseline value improves efficiency (see Footnote 4). The time effects common to all enterprises, η_t, are captured by time dummy variables and the error term, ε_{it}, is clustered to control for autocorrelation within the respective enterprises.

In order to take into account the impartial compliance to the classroom training component, we also use instrumental approach to estimate local average treatment effect (LATE) (Imbens and Angrist, 1994). Specifically, we replace Z^{BOTH}_i and Z^{CLASS}_i in equation (1) with P^{BOTH}_i and P^{CLASS}_i, where the former is a dummy variable taking the value of one if an enterprise *i* participated in both component of the training and the latter takes the value of one if an enterprise articipated in the classroom training. We use Z^{BOTH}_i and Z^{CLASS}_i as instruments for P^{BOTH}_i and P^{CLASS}_i to estimate the training impacts on enterprises that complied with the random treatment assignments. As the assignment of treatment is random (see Table 2), our instrumental variable strategy is valid. The LATE results are reported in Appendix Tables 3 to 5.

Next, in addition to the reduced-form estimation of the training impacts, we adopt mediation analysis to shed light on possible mechanism through which the training intervention improved business performance. Following Imai et al. (2011), we consider y_i as $y_i\{Z_i, M_i(Z_i)\}$, where Z_i is a binary treatment variable and $M_i(Z_i)$ is a mediator for enterprise *i* under the treatment status $Z_i = z$. In our context, M_i is management skills or entrepreneurial spirit. The total treatment effect of Z_i on y_i can be expresses as $\{y_i(Z_i=1) - y_i(Z_i=0)\}$, which can be further decomposed into

$$y_i(1) - y_i(0) = [y_i\{1, M_i(z)\} - y_i\{0, M_i(z)\}] + [y_i\{z, M_i(1)\} - Y_i\{z, M_i(0)\}], \quad (2)$$

where the former term represents the direct effect of the treatment whereas the latter term represents the mediation effect. The former includes all causal mechanism linking the treatment to the outcome except for that through a mediating variable. Applying logic to estimate average treatment effect in the potential outcome framework, our interest lies in estimating the average direct effect (ADE), that is, $E[y_i\{1, M_i(z)\} - y_i\{0, M_i(z)\}]$, and the average causal mediation effect (ACME), $E[y_i\{z, M_i(1)\} - Y_i\{z, M_i(0)\}]$.

According to Imai et al. (2011), sequential ignorability assumption is needed to compute ADE and ACME, which can be formally expressed as;

$$\begin{aligned} \{y_i(z', m), M_i(z)\} \perp Z_i | X_i = x \\ y_i(z', m) \perp M_i(z) | Z_i = z, X_i = x . \end{aligned} \quad (3)$$

In our study, we used STATA "mediation" command developed by Hicks and Tingley (2011). The command fits the following two equations and computes point estimates and confidence intervals of ADE and ACME based on simulation;

$$\begin{aligned} M_i &= \alpha_2 + \beta_2 Z_i + \xi_2 X_i + \varepsilon_{i2} \\ y_i &= \alpha_3 + \beta_3 Z_i + \gamma M_i + \xi_3 X_i + \varepsilon_{i3}. \end{aligned} \quad (4)$$

If the sequential ignorability assumption holds, the error terms ε_{i2} and ε_{i3} in equation (4) are uncorrelated. This assumption, however, can never directly tested. Hence, the command also conducts sensitivity analysis by shifting the correlation coefficient of error

terms ε_{i2} and ε_{i3} to identify a threshold value of the correlation coefficient at which ACME becomes zero. The threshold value informs the extent to which the sequential ignorability assumption can be relaxed.

Training Impacts

Table 4 presents the estimated training impacts by pooling the samples in the two clusters. Consistent with Table 3, Panel A shows that the training had positive impacts on enterprise survival. The enterprises invited to both component of the training were 12.5 percentage point more likely to continue business two years after the training intervention and 25.3 percentage point more likely to do so five years after. *P*-values reported to the right of the Table suggest that we can reject the null hypothesis that both of the coefficients were jointly zero.

Tables 5 and 6 present separately estimated impacts in the steel cluster and in the knitwear cluster, respectively. These Tables illustrate that the combination of two component had largest impacts in both clusters, whereas the classroom component had larger impacts than the on-site component in the steel cluster and 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 enterprises in the short span because it was difficult to change their workshop layout on trial and error basis. Instead, systematic and abstract knowledge on management and business taught in the classroom training helped the treated enterprises to apply learned knowledge in the long span. On the other hand, the on-site coaching was more effective in the labor-intensive knitwear cluster, where changes in workshop layouts was relatively

easy. The team of instructors provided concrete and tailored advice on how to improve productivity as well as on how to motivate and mobilize workers.

Next, we analyze the training impacts on business performance. *Kaizen* production approach emphasizes reduction of cost for productivity improvement, and thus, the value added is more likely to be improved by our training intervention than the sales revenue.[7] As we have a number of enterprises with below zero value added or extremely large value added, we transform the value added, following the lead of Burbidge et al. (1988), and define log of value added as $\log\{y + (y^2 + 1)^{0.5}\}$. In Tables 4 to 6, Panel B presents training impacts on the unconditional value added whereas Panel C presents that on the conditional value added. Our training, particularly the combination of classroom and on-site training programs, had positive and significant impacts. As the training dramatically increased the survival rate, the impacts were stronger on the unconditional value added in which exit enterprises are assumed to have zero value added.

When we take a closer look, it took time for training impacts to emerge in the steel cluster, where the classroom training vis-à-vis on-site training was useful, because the training participants needed time to apply their abstract knowledge into their actual business. The coefficients were not significant in the 1st or 2nd follow-up surveys but became significant in the 3rd follow-up survey. This suggests that some of the existing studies of training intervention evaluated impacts so early that they were yet to be realized in business. In the knitwear cluster, we only find the sustained impacts among Class+Onsite Group. We interpret that the tailored coaching helped the knitwear enterprises to improve their business in the short span but only the hand-in technical support did not sustainably improved their business performance. Instead, such hand-in

[7] Although we only report the results of value added, similar results were obtained for sales revenue.

support had sustainable effects only when combined with systematic knowledge on business taught in the classroom training.

Mechanism

We find that the training significantly improved business of the treated enterprises, we are now interested in mechanism. First, we consider management skills. In Tables 4 to 6, Panel D presents results on *Kaizen* score whereas Panel E presents results on overall management score. As it was not possible to collect information of adopted management practices from exit enterprises, these Panels present the training impacts on management skills only among the surviving enterprises. The most important finding is that the training impacts on management were sustained in the 3rd follow-up survey. In particular, the combination of the two component had largest impacts in both clusters. The enterprises invited to both training components adopted 2.5 more *Kaizen* practices than the control group five years after the training intervention.

In addition to the significantly improved management skills, Panel F shows that entrepreneurial spirit was significantly improved among the treated enterprises, particularly among Class+Onsite Group. The enterprises in this group had 2.0 points higher entrepreneurial spirit score at the time of 3rd follow-up survey, when the control group average was only 0.89. When we take a closer look, the combination had strongest impacts in both clusters. In addition, the classroom training had effect in the steel cluster whereas the on-site training had effect in the knitwear cluster, exhibiting the similar pattern as the training impacts on business performance. Together with our findings that the training had sustained impacts on management skills and entrepreneurial spirit, such similar pattern suggests that management skills and entrepreneurial spirits were most

likely to be the channel linking the training intervention and improved business performance.

In order to formally examine the channel, Table 7 reports the results of mediation analysis. Based on equation (4), we define the overall management score as a mediating variable in column 1 whereas we define the entrepreneurial score as a mediating variable in column 2. As our sample was too small for conducting simulation of hundreds times if we split the sample into four groups, we simply split into the treatment group and the control group as in columns 5 and 10 in Table 2. Hence, the reported results are the impact of either or both component of our training programs. Toward the bottom of Table 7, ACME of the management skills was estimated to be 0.55, accounting for 71.2% of the total effect of training intervention on unconditional value added, whereas ACME of the entrepreneurial spirit was estimated to be 0.46, accounting for 46.6% of the total effect. Therefore, the results confirm that management skills and entrepreneurial spirits are the mechanism through which the training improved business performance. Our sensitivity analysis shows that the ACME are positive as long as the correlation coefficient between error terms in equation (4) is less than 0.21 for the management skills and less than 0.14 for the entrepreneurial spirit.

Robustness Check

Data on business performance is known as noisy and has large variance (de Mel et al. 2009). In order to control for the influence of outliers, Panel A and B in Table 8 report the results by winsorizing and trimming the top 5 percentile of the distribution as a robustness check for the impacts on the unconditional value added. As an alternative robustness check for value added, Panel C reports the results with the record keeping score controlled

in the regression. The training participants may have come to pay more meticulous attention to record keeping than the non-participants and became able to provide more accurate information on their business. In order to control for such possibility of systematic measurement errors, we followed the lead of de Mel et al. (2014) and added the record keeping score as a control to the right-hand side of the otherwise same regression equation. The estimated coefficients are similar in magnitude and statistical significant as those reported in Table 4, hence, reinforcing our conclusion that the training had sustained impacts on business performance.

IV. Conclusion

This study has taken advantage of the randomized design of training intervention and the panel data covering five years to analyze longer-term impact of management training. This paper has found that the *Kaizen* training had favorable effects on management practices, and that these effects lasted at least for five years. In addition, training improved the attitude and mindset of enterprises owner/managers, making it possible for them to improve their business. Due to these long-term changes, the treated enterprises are more likely to survive and have higher business performance than the control enterprises. Our results suggest that managerial training intervention has impacts on enterprise dynamics in a few years or possibly in a longer interval.

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TABLE1—TIMELINE

	(1) Steel	(2) Knitwear
Baseline survey	2010 June *N*=153 (153)	2010 July *N*=159 (159)
Classroom training program	2010 June-July or September	2010 July-August
Interim survey	2010 October *N*=153 (153)	2010 September *N*=159 (159)
On-site training program	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 (89)	2016 February *N*=154 (108)

Notes: 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 enterprise among the surveyed enterprises is reported.

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
	N.A.	N.A.	N.A.	N.A.		(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)	
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

Notes: 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.

TABLE 3—ENTERPRISE SURVIVAL

	(1) Steel Class + On-site	(2) Steel Class-only	(3) Steel On-site-only	(4) Steel Control	(5) Steel (1), (2), (3) v.s. (4)	(6) Knitwear Class + On-site	(7) Knitwear Class-only	(8) Knitwear On-site-only	(9) Knitwear Control	(10) Knitwear (6), (7), (8) v.s. (9)
No. of enterprises in the group	32	76	10	35		32	57	16	54	
In the 2nd follow-up survey										
No. of surviving enterprises	31	62	6	29		31	53	16	47	
Survival rate (%)	96.7	81.6	60.0	82.9	0.88	96.7	93.0	100.0	87.0	0.06
In the 3rd follow-up survey										
No. of surviving enterprises	21	47	6	13		28	35	14	32	
Survival rate	65.6	61.8	60.0	37.1	0.00	87.5	66.0	87.5	59.2	0.12

Notes: *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.

TABLE 4—TRAINING IMPACT (TWO CLUSTERS POOLED, ITT)

	Sample size	1st follow-up	2nd follow-up	3rd follow-up	*P*-value equality	*P*-value all zero
Panel A: Survival (yes = 1)						
Class+Onsite	619		0.125	0.253	0.12	0.00
			(0.046)	(0.076)		
Class-only			0.029	0.123	0.22	0.20
			(0.047)	(0.069)		
Onsite-only			-0.008	0.247	0.00	0.01
			(0.079)	(0.098)		
Control mean			0.85	0.52		
Panel B: Unconditional Value Added (log)						
Class+Onsite	931	0.487	1.572	3.603	0.00	0.00
		(0.228)	(0.496)	(0.808)		
Class-only		0.068	0.489	1.683	0.09	0.08
		(0.243)	(0.468)	(0.710)		
Onsite-only		0.065	0.859	0.562	0.58	0.67
		(0.327)	(0.712)	(1.323)		
Control mean		7.33	5.34	1.60		
Panel C: Conditional Value Added (log)						
Class+Onsite	783	0.400	0.708	3.506	0.03	0.00
		(0.209)	(0.436)	(1.189)		
Class-only		-0.036	0.366	2.311	0.11	0.17
		(0.233)	(0.387)	(1.179)		
Onsite-only		0.016	1.067	-0.147	0.02	0.04
		(0.296)	(0.415)	(1.810)		
Control mean		7.33	6.26	3.07		
Panel D: Kaizen Score (0-11)						
Class+Onsite	780	3.238	3.639	2.523	0.00	0.00
		(0.245)	(0.212)	(0.360)		
Class-only		0.643	0.992	0.811	0.04	0.00
		(0.221)	(0.221)	(0.339)		
Onsite-only		2.407	2.990	1.449	0.00	0.00
		(0.265)	(0.257)	(0.381)		
Control mean		4.85	4.87	5.18		
Panel E: Management Score (0-30)						
Class+Onsite	775	5.227	5.229	4.237	0.34	0.00
		(0.444)	(0.368)	(0.817)		
Class-only		1.095	1.140	1.844	0.37	0.01
		(0.422)	(0.355)	(0.619)		
Onsite-only		3.698	3.887	3.670	0.93	0.00
		(0.591)	(0.510)	(0.977)		
Control mean		14.58	15.46	6.16		
Panel F: Entrepreneurial Motivation (0-7)						
Class+Onsite	504	0.534		2.027	0.00	0.00
		(0.070)		(0.212)		
Class-only		0.250		0.720	0.01	0.00
		(0.058)		(0.188)		
Onsite-only		0.272		1.447	0.00	0.00
		(0.098)		(0.272)		
Control mean		0.10		0.89		

Notes: Numbers in parentheses are standard errors clustered at the enterprise level. All regressions control for the control variables listed in Panel A in Table 2, the knitwear cluster dummy, and the survey round dummies as explanatory variables even though their estimated coefficients are not reported. In Panels B and C, the baseline values of each dependent variable are also controlled. *P*-values are for test that the treatment effect is equal in all the follow-up surveys; and that the treatment effect is zero in all the follow-up surveys.

TABLE 5—TRAINING IMPACT (STEEL CLUSTER, ITT)

	Sample size	1st follow-up	2nd follow-up	3rd follow-up	*P*-value equality	*P*-value all zero
Panel A: Survival (yes = 1)						
Class+Onsite	306		0.127	0.272	0.28	0.05
			(0.075)	(0.123)		
Class-only			-0.015	0.244	0.02	0.04
			(0.080)	(0.102)		
Onsite-only			-0.249	0.208	0.00	0.00
			(0.172)	(0.181)		
Control mean			0.83	0.37		
Panel B: Unconditional Value Added (log)						
Class+Onsite	459	0.208	1.086	3.678	0.02	0.02
		(0.269)	(0.850)	(1.264)		
Class-only		-0.374	-0.156	3.152	0.00	0.02
		(0.360)	(0.783)	(1.026)		
Onsite-only		0.251	-1.275	1.268	0.44	0.51
		(0.420)	(1.445)	(1.972)		
Control mean		8.22	5.97	0.57		
Panel C: Conditional Value Added (log)						
Class+Onsite	368	0.171	0.033	5.010	0.17	0.14
		(0.283)	(0.738)	(2.481)		
Class-only		-0.395	-0.095	5.154	0.08	0.16
		(0.362)	(0.632)	(2.321)		
Onsite-only		0.296	0.734	2.100	0.69	0.66
		(0.384)	(0.776)	(3.679)		
Control mean		8.26	7.20	1.53		
Panel D: Kaizen Score (0-11)						
Class+Onsite	367	2.338	2.689	2.966	0.23	0.00
		(0.384)	(0.290)	(0.525)		
Class-only		0.423	0.315	1.236	0.06	0.04
		(0.309)	(0.240)	(0.427)		
Onsite-only		0.895	0.869	1.844	0.50	0.02
		(0.508)	(0.467)	(0.736)		
Control mean		6.20	6.41	4.46		
Panel E: Management Score (0-30)						
Class+Onsite	367	4.113	3.943	0.859	0.01	0.00
		(0.692)	(0.522)	(1.237)		
Class-only		0.927	0.326	0.466	0.33	0.42
		(0.618)	(0.499)	(1.134)		
Onsite-only		1.909	1.313	0.672	0.63	0.30
		(1.136)	(0.936)	(1.381)		
Control mean		15.60	16.13	7.38		
Panel F: Entrepreneurial Motivation (0-5)						
Class+Onsite	239	0.356		1.120	0.04	0.00
		(0.101)		(0.353)		
Class-only		0.181		0.656	0.15	0.00
		(0.069)		(0.313)		
Onsite-only		0.241		0.256	0.97	0.04
		(0.111)		(0.347)		
Control mean		0.05		1.00		

Notes: Same as Table 4.

TABLE 6—TRAINING IMPACT (KNITWEAR CLUSTER, ITT)

	Sample size	1st follow-up	2nd follow-up	3rd follow-up	*P*-value equality	*P*-value all zero
Panel A: Survival (yes = 1)						
Class+Onsite	313		0.093	0.246	0.14	0.02
			(0.058)	(0.094)		
Class-only			0.055	0.009	0.65	0.60
			(0.054)	(0.095)		
Onsite-only			0.131	0.252	0.29	0.01
			(0.053)	(0.109)		
Control mean			0.87	0.63		
Panel B: Unconditional Value Added (log)						
Class+Onsite	472	0.469	1.864	3.881	0.02	0.00
		(0.312)	(0.577)	(0.989)		
Class-only		0.046	0.957	0.423	0.26	0.36
		(0.281)	(0.550)	(0.975)		
Onsite-only		-0.182	2.050	-0.100	0.00	0.00
		(0.381)	(0.578)	(1.706)		
Control mean		6.73	4.94	2.32		
Panel C: Conditional Value Added (log)						
Class+Onsite	415	0.484	1.231	3.347	0.03	0.00
		(0.308)	(0.496)	(1.235)		
Class-only		0.051	0.574	0.779	0.47	0.59
		(0.282)	(0.475)	(1.392)		
Onsite-only		-0.229	1.148	-1.157	0.01	0.03
		(0.381)	(0.540)	(2.017)		
Control mean		6.73	5.68	3.69		
Panel D: Kaizen Score (0-11)						
Class+Onsite	413	3.970	4.312	2.780	0.00	0.00
		(0.270)	(0.237)	(0.327)		
Class-only		0.393	1.194	1.558	0.00	0.00
		(0.268)	(0.326)	(0.355)		
Onsite-only		3.385	3.948	1.167	0.00	0.00
		(0.237)	(0.222)	(0.343)		
Control mean		3.92	3.89	5.47		
Panel E: Management Motivation (0-30)						
Class+Onsite	408	6.088	6.368	6.571	0.65	0.00
		(0.503)	(0.429)	(1.032)		
Class-only		0.471	1.570	2.668	0.00	0.00
		(0.515)	(0.500)	(0.875)		
Onsite-only		4.807	4.864	4.709	0.99	0.00
		(0.611)	(0.475)	(1.150)		
Control mean		13.88	15.02	5.66		
Panel F: Entrepreneurial Spirit (0-5)						
Class+Onsite	265	0.658		2.600	0.00	0.00
		(0.097)		(0.238)		
Class-only		0.234		0.508	0.27	0.01
		(0.089)		(0.244)		
Onsite-only		0.306		1.916	0.00	0.00
		(0.140)		(0.277)		
Control mean		0.13		0.84		

Notes: Same as Table 4.

TABLE 7—MEDIATION ANALYSIS (TWO CLUSTERS POOLED)

	(1) M_i = Management Score	(2) M_i = Entrepreneurial Motivation
First stage (outcome = M_i)		
Z_i	2.655	0.652
(=1 if invited to any component of the training)	(0.361)	(0.077)
Age	0.587	-0.004
	(0.180)	(0.041)
Age squared	-0.623	0.003
	(0.204)	(0.047)
Male	0.098	0.035
(yes = 1)	(0.382)	(0.084)
Years of education	0.435	0.036
	(0.083)	(0.016)
Business training experience	2.457	0.228
(yes = 1)	(0.797)	(0.221)
Second stage (outcome = unconditional value added in log)		
M_i	0.207	0.669
	(0.033)	(0.244)
Z_i	0.161	0.471
(=1 if invited to any component of the training)	(0.324)	(0.441)
Age	0.157	0.260
	(0.119)	(0.167)
Age squared	-0.154	-0.260
	(0.136)	(0.197)
Male	-0.121	-0.162
(yes = 1)	(0.232)	(0.342)
Years of education	0.146	0.245
	(0.044)	(0.061)
Business training experience	0.784	1.473
(yes = 1)	(0.271)	(0.362)
Average causal mediated effect (ACME)	0.553	0.459
	[0.339 0.788]	[0.166 0.745]
Average direct effect (ADE)	0.159	0.484
	[-0.539 0.791]	[-0.423 1.431]
Total effect	0.712	0.943
	[0.095 1.303]	[0.024 1.752]
% of total effect mediated	0.712	0.464
	[0.411 4.280]	[0.232 2.609]
Correlation coefficients of error term at which ACME = 0	0.205	0.145
Sample size	775	504

Notes: Numbers in parentheses are standard errors clustered at the enterprise level and the numbers in bracket show the 95% confidence interval.

TABLE 8—IMPACT ON UNCONDITIONAL VALUE ADDED (ROBUSTNESS CHECK, TWO CLUSTERS POOLED, ITT)

	Sample size	1st follow-up	2nd follow-up	3rd follow-up	*P*-value equality	*P*-value all zero
Panel A: Winsorizing the top 5 percentile						
Class+Onsite	931	0.526	1.589	3.623	0.00	0.00
		(0.223)	(0.494)	(0.800)		
Class-only		0.105	0.527	1.728	0.08	0.06
		(0.241)	(0.466)	(0.704)		
Onsite-only		0.084	0.817	0.582	0.61	0.69
		(0.323)	(0.708)	(1.297)		
Control mean		7.32	5.33	1.57		
Panel B: Trimming the top 5 percentile						
Class+Onsite	883	0.485	1.619	3.827	0.00	0.00
		(0.229)	(0.503)	(0.816)		
Class-only		0.100	0.575	1.969	0.04	0.02
		(0.249)	(0.468)	(0.703)		
Onsite-only		-0.045	0.599	0.518	0.70	0.86
		(0.339)	(0.763)	(1.348)		
Control mean		7.22	5.15	1.07		
Panel C: Controlling record keeping score						
Class+Onsite	783	0.101	0.273	3.400	0.02	0.04
		(0.189)	(0.435)	(1.192)		
Class-only		-0.124	0.258	2.116	0.12	0.23
		(0.210)	(0.364)	(1.190)		
Onsite-only		-0.189	0.841	-0.220	0.01	0.03
		(0.275)	(0.392)	(1.811)		
Control mean		7.33	5.34	1.60		

Notes: Same as Table 4.

APPENDIX TABLE 1—*KAIZEN* AND ENTREPRENEURIAL SCORES

Panel A: Kaizen Score (0-11)
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.
Panel B: Entrepreneurial Motivation Score (0-7)
The entrepreneur is definitely sure to willing to learn business/management.
The entrepreneur actually participated in business/management training between 2011 and 2015.
The entrepreneur invited external advisor/consultant/monitors to the workshop in 2015.
The entrepreneur visited foreign county for business-related activities in 2015.
The entrepreneur has a plan to introduce new product or upgrade the quality of current product.
The entrepreneur is confident in training and communicating with workers to produce new or higher quality product.
The entrepreneur actually introduced a new product or upgraded the current product.

APPENDIX TABLE 2—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
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

Notes: *P*-values are from the *t*-test concerning the null hypothesis that the mean values are the same among 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.