Management skill, entrepreneurial mindset, and firm survival: Evidence from randomized experiments and repeated surveys in Vietnam

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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 firms 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. Our training not only improved management capacity of the treated entrepreneurs but also motivated them to continue learning management as well as to upgrade their product. Due to these changes triggered by the training, the treated firms, particularly a sub-group that received both classroom and on-site training programs, continued to have significantly higher business performance than the control group.

Keywords: Management training, *Kaizen*, Small and medium enterprises, Vietnam
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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. Only a 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.

One of the important remaining questions in business training is its longer-term impact on firm dynamics. A recent study by Giorcelli (2016) exploits a quasi-random transfer of managerial knowledge to medium to large Italian firms after the World War II and finds that the impact had been enhanced over time and the significant impact was observed at least fifteen years after the intervention. In addition, Bloom et al. (2017) find that an intensive management consultation to large Indian manufacturers had significant impact eight years after the intervention. Echoing the finding of these studies, our study attempts at providing a partial answer to a question of whether training impact on business performance dissipates or enhances over time, while focusing on small manufacturers, that is, more representative form of firms in the developing world.

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. While the intensive five-month consultation by Bloom et al. (2013; 2017) cost 75,000 USD per treated firm, each of our training program cost only 2,000 USD per treated firm, thus providing a possibility for scaling-up of similar training program as a policy instrument.

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 follow-up survey was less than 2% of the baseline sample. In addition, we found that the treated firms, particularly a sub-group that received both classroom and on-site training programs, continued to have 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 look at management capacity of the treated entrepreneurs. To measure their management capacity, we collected data on a number of diagnostic criteria by enumerators' visual inspection and interview to firm owner/managers. We use a method,

which combines the data collection strategy developed by Bloom and van Reenen (2007) and that by McKenzie and Woodruff (2016). By comparing the data before and after the training intervention, we find that the treated firms applied a significantly greater number of good management practices after the training, as reported in our previous study (Higuchi et al., 2015). More importantly, they continued to adopt these practices five years after the intervention.

In addition, we also find that our training improved the motivation of the treated entrepreneurs. A small but emerging literature present evidence that motivational or attitudinal aspect of entrepreneurs is important determinant of firm performance, and such aspect can be improved by experimental intervention (e.g., Bruhn et al. 2017; Campos et al. 2017; Lafortune et al. 2017). Although we first hypothesized that the improved management would be a main channel linking the training and business performance, the very large impact on firm survival cannot be fully explained by the improved management, and thus, we collected data on entrepreneurs' motivational aspect and subsequent changes in their behavior in the latest survey. We find that the treated entrepreneurs were more likely to participate in another business training, have external consultants visit their workshop, and start producing higher quality products. Hence, we argue that the higher business performance was due to sustainably improved management skill as well as changes in entrepreneurial mindset.

This paper contributes to the business training literature (e.g., Bjorvatn and Tungodden 2010; Karlan and Valdivia 2011; Mano et al. 2012). In addition, this paper contributes to the following two strands of literature. Firstly, 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 firm survival because we found that managerial intervention helped the treated enterprises to survive. Secondly, this paper contributes to an emerging literature of identification of gazelles, that is, firms with high growth potential (e.g., Diao et al. 2016; Fafchamps and Woodruff 2017; Grimm et al. 2012; McKenzie 2017). The identification of gazelles is an important policy agenda for allocating scarce business resource to promising enterprises. Based on our finding that entrepreneurs selectively decided to participate in the training (the compliance rate for our 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 firms.

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 firms 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 a market-level randomization by McKenzie and Puerto (2017), is adopted. 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 knowledge 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

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

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 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 firm 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 large 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 firms.

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 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 only half was invited to the on-site training component. On-site training began with a one-day seminar, in which the model firm mangers 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' firms 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 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 firms 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 firms) 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 status and invited randomly selected enterprises from both strata to the on-site training. Given the budget constraint and limited number of firms 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 firms who would receive both components of the training. Hence, the number of samples in "Onsite-only" Group is particularly small.

While 108 firms in the steel cluster were invited to the classroom training program, only 41 firms actually participated. In the knitwear cluster, 89 firms were invited, and 52 firms actually participated. We issued a certificate to the firms 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[2]. 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)[3], overall management score based on 26 questions proposed by McKenzie

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

[3] 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

and Woodruff (2016)[4], employment size in terms of the number of workers, and real annual values of sales revenue and value added, which is defined as sales revenue minus various costs except for labor cost.[5]

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)[6], 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

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.

[4] 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, 1st, and 2nd follow-up surveys, the score ranges from 0 to 30 while it ranges 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 the footnote 3, we did not collect overall management score in the baseline survey (see Table 2).

[5] 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.

[6] As described in the footnote 4, 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).

assignment of intervention was random.

III. Results

Outcome Variables

In addition to the outcome variables presented in Panel B of Table 2, our variables of interest include a survival dummy and a number of actions taken by the entrepreneurs. Table 1 shows the number of surviving firms in the parenthesis. As we define 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 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 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 percent and 92 percent. Similarly, 64 steel enterprises and 46 knitwear enterprises had no production in 2015 and thus are defined as exit ones. The number of surviving firms 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 percent and 68 percent. Note that a few enterprises that had no production in 2012 re-started the production by 2015, and thus, were defined as exit one in the 2nd follow-up survey while as surviving one at the 3rd follow-up survey.

Table 3 shows the number of survival firms 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 percent and 88 percent in the steel and knitwear cluster, respectively, whereas the corresponding survival rate among

the control Group was 37 percent and 59 percent. These differences suggest that the training intervention had positive impacts on firm 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 value added.

In order to examine mechanism linking the training intervention and business performance, we analyze managerial skills and entrepreneurial mindset. Managerial skills were measured using *Kaizen* and overall management scores as described in Section II. In addition to the improvement in management capacity by training intervention, a number of recent studies have found that entrepreneurial motivation is important determinant of business success. For instance, Campos et al. (2017) and Lafortune et al. (2017) found that a motivational intervention had positive impact on business performance, which is of similar or even greater magnitude. Whereas these two studies targeted microentrepreneurs in Togo and Chile, respectively, we examine entrepreneurial motivation as a possible channel for business improvement among small and medium-sized manufacturers. In order to analyze motivational changes among our sample entrepreneurs, we collected information on a number of motivational aspect of entrepreneurs as well as a number of actual actions taken by them. The question includes (i) the entrepreneur is definitely sure to willing to learn business/management[7], (ii) whether the entrepreneur participated in business/management training between 2011 and 2015, (iii) whether the entrepreneur invited external advisor/consultant/monitors to the workshop in 2015, (iv) whether the entrepreneur visited foreign county for business-

[7] This information was collected using certainty approach, following Blumenschein et al. (2008). We first asked whether "the entrepreneur is definitely sure to willing to learn business/management," which was 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.

related activities in 2015, (v) whether the entrepreneur has a plan to introduce new product or upgrade the quality of current product, (vi) whether the entrepreneur is confident in training and communicating with workers to produce new or higher quality product, and (vii) whether the entrepreneur actually introduced a new product or upgraded the current product.

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 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 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 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 the footnote 5). 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 firms.

Training Impact on Business

Table 4 presents the estimated training impacts by pooling the samples in the two clusters. The training impact on firm survival observed in Table 3 is confirmed. Panel A shows that the firms 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. When we take a closer look, it took time for training impacts to emerge, particularly in the steel cluster. A number of coefficients were not significant in the 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.

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 works in both clusters although the statistical power was reduced. 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 on trial and error basis. 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 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.[8] 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. The point estimates are all positive, but only the combination of classroom and on-site training programs has significant coefficient. If we pool all the training programs to have a dummy variable which takes one if a firm is invited to any component of the training, the coefficient is positive and significant (results not (yet) reported). 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 although *p*-value reported to the right of the Table suggests that the impact of the combination has marginally significant impact on unconditional value added too.

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

Mechanism

We find that the training significantly improved business of the treated firms, 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 firms, these Panels present the training impacts on management skills only among the surviving firms. Worse-managed firms are 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. 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 firms invited to both training components adopted 2.5 more *Kaizen* practices than the control group five years after the training intervention, when the baseline score before the training was 4.9.

In addition to the significantly improved management skills, Panel F shows that entrepreneurial mindset significantly improved among the treated enterprises, particularly among Class+Onsite Group. The enterprises in this group had 2.0 points higher entrepreneurial 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. This suggests that change in entrepreneurial motivation was most likely to be the channel linking the training intervention and improved business performance.

Robustness Check

[Table 7 will be added] 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 7 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. In Panel C, we following the lead of Burbidge et al. (1988) and transform value added into a log-like form, $\{y + (y^2 + 1)^{0.5}\}$, to mitigate the influence of left-skewed distribution of value added, taking into account a number of firms with below zero value added. As an alternative robustness check for value added, Panel D 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 dynamics, 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 time span.

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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 (*in mil. VND = 50 USD*)						
Class+Onsite	931	550.1	483.4	526.5	0.97	0.02
		(328.5)	(188.9)	(342.1)		
Class-only		119.9	160.5	270.8	0.87	0.39
		(233.1)	(133.2)	(197.6)		
Onsite-only		235.5	165.6	598.4	0.56	0.47
		(536.7)	(240.9)	(401.1)		
Control mean		1637.8	696.7	298.2		
Panel C: Conditional Value Added (in mil. VND = 50 USD)						
Class+Onsite	783	557.0	360.1	496.1	0.81	0.09
		(298.2)	(197.5)	(477.0)		
Class-only		162.9	202.5	416.8	0.82	0.33
		(203.8)	(134.8)	(352.4)		
Onsite-only		250.1	466.3	761.6	0.74	0.07
		(500.6)	(199.3)	(501.6)		
Control mean		1637.8	826.0	637.9		
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 Score (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 (in mil. VND = 50 USD)						
Class+Onsite	459	778.4	378.6	293.5	0.78	0.36
		(508.6)	(363.3)	(668.4)		
Class-only		-66.7	205.1	593.2	0.50	0.44
		(342.6)	(223.4)	(402.9)		
Onsite-only		899.2	-682.1	78.2	0.41	0.56
		(1171.3)	(590.3)	(726.2)		
Control mean		2950.4	1148.5	307.3		
Panel C: Conditional Value Added (in mil. VND = 50 USD)						
Class+Onsite	368	831.4	488.0	857.1	0.82	0.17
		(450.1)	(384.8)	(1258.6)		
Class-only		23.9	565.2	1282.2	0.26	0.12
		(307.9)	(248.3)	(1066.8)		
Onsite-only		1017.0	303.7	1295.9	0.70	0.61
		(1034.9)	(587.9)	(1235.0)		
Control mean		2950.4	1403.1	983.4		
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 Score (0-7)						
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 (in mil. VND = 50 USD)						
Class+Onsite	472	238.5	398.6	819.4	0.10	0.00
		(177.0)	(168.3)	(222.2)		
Class-only		58.1	99.3	174.8	0.87	0.69
		(172.1)	(109.6)	(168.9)		
Onsite-only		90.5	417.8	665.4	0.21	0.08
		(235.1)	(200.4)	(450.3)		
Control mean		680.6	398.6	291.8		
Panel C: Conditional Value Added (in mil. VND = 50 USD)						
Class+Onsite	415	243.6	340.8	803.8	0.19	0.00
		(174.1)	(180.3)	(257.4)		
Class-only		97.7	66.0	371.4	0.51	0.47
		(162.6)	(120.3)	(249.5)		
Onsite-only		44.3	359.9	635.5	0.17	0.07
		(192.5)	(175.9)	(472.2)		
Control mean		680.6	463.5	505.0		
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 Score (0-7)						
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.

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.

APPENDIX TABLE 2—BALANCE CHECK

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	Steel	Steel	Steel	Steel	Steel	Steel	Knit-wear	Knit-wear	Knit-wear	Knit-wear	Knit-wear	Knit-wear
	Class + Onsite v.s. Class-only *p*-value	Class + Onsite v.s. Onsite-only *p*-value	Class + On-site v.s. Control *p*-value	Class-only v.s. Onsite-only *p*-value	Class-only v.s. Control *p*-value	Onsite-only v.s. Control *p*-value	Class + Onsite v.s. Class-only *p*-value	Class + Onsite v.s. Onsite-only *p*-value	Class + On-site v.s. Control *p*-value	Class-only v.s. Onsite-only *p*-value	Class-only v.s. Control *p*-value	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.