



Consequences of *Kaizen* Practices in MSMEs in the Philippines: The Case of the Manufacturing Productivity Extension Program (MPEX)

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I INTRODUCTION

The micro, small, and medium enterprises (MSMEs) sector is regarded by governments as “a means to achieve a dynamic and flourishing private sector, by increasing exports and enhancing industrial competitiveness, and

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to ensure more equitable development in terms of a broader distribution of assets, through creating jobs and increasing income, and hence improving the well-being of poor and marginalized groups” (Jeppesen 2005, 463). In the Philippines, the government through its Philippine Development Plan 2017–2022 included MSMEs in one of its outcomes in terms of access to economic opportunities in industry and services. This recognition can be traced back in 1991 when Republic Act No. 6977 or the Magna Carta for Small Enterprises was passed into law which recognizes that “small and medium scale enterprises have the potential for more employment generation and economic growth and therefore can help provide a self-sufficient industrial foundation for the country.” In 2013, Republic Act No. 10644 declared that it is the state’s policy “to foster national development, promote inclusive growth, and reduce poverty by encouraging the establishment of micro, small and medium enterprises (MSMEs) that facilitate local job creation, production and trade in the country.”

The government’s recognition of MSMEs is largely driven by the sector’s impact to the economy. According to the Philippine Statistics Authority, in 2016, the sector, composed of firms with capitalization below P100 million and/or with less than 200 employees, employed 4.88 million people. This is 63 percent of the total number of jobs generated by all types of business establishments. In 2014, MSMEs contributed 35.7 percent of gross value added and 25 percent of export revenues. The manufacturing sector, with 115,748 MSME firms, employed 760,416 people or 16.1 percent of total employment. While it is not the largest sector, it is seen to have the greatest potential for upscaling because of its export potential, and has the biggest long-term value-added contribution.

Given the impact of MSMEs in the Philippine economy, their growth and expansion are of strategic importance. Government agencies have been implementing programs to assist MSMEs in realizing their potential either by making technology and financing available through low-interest loans and shared service facilities or by transferring technical know-how through extension programs or consultancies. The Department of Science and Technology’s (DOST) Productivity Extension for Export Promotion (MPLEX) program, renamed as Manufacturing Productivity Extension Program, is one of these government initiatives. Initiated in 1991 by the Technology Application and Promotion Institute (TAPI) of DOST, it seeks to promote increase in productivity of manufacturing firms to make their products more competitive both in price and in quality in the global

and local markets (DOST 2009). It was inspired by the work of China Productivity Center in Taiwan where industrial engineers assisted industry in identifying and implementing practices that enhanced firm productivity (Badiru and Chen 1992, 53–55).

The MPEX program assists MSMEs in the manufacturing sector to attain higher productivity through improvements in the overall operation of the firm (DOST 2009). It covers the agro and food processing, furniture, gifts and holiday decorations, information technology, materials science, metals and engineering, and microelectronics sectors. The process starts with the pre-qualification of potential beneficiaries conducted by DOST regional offices and consultants from a list of firms identified or endorsed by the Provincial Science and Technology Directors, Department of Trade and Industry Provincial Offices, and other organizations in the region. After identifying firms that match the consultants' expertise and are willing to sign a commitment contract to implement consultant recommendations, an initial productivity audit is conducted to diagnose the firm's financial, management, marketing, and production performance.

MPEX consultants examine major areas like the manufacturing process, plant and equipment design, product planning and control system, materials management system, quality control and assurance system, safety and housekeeping practices, financial control system, human resource, and support services utilization. An inception report is submitted to the DOST regional office containing initial assessment, evaluation, and recommendations. At least three priority intervention areas are identified. After a period of two to three months, a validation of the finding and recommendations is conducted by the MPEX consultant to determine if the recommended improvements were implemented. Finally, a report is given to the beneficiary and the DOST regional office. The consultancy is valued at US \$800 per firm and is fully subsidized by government.

While *Kaizen* is not clearly advertised, the structural foundations of MPEX are fundamentally *Kaizen* elements. The prime aim is to improve firm-level productivity and quality, and eventually promote growth. MPEX is implementing *Kaizen* at the firm level instigated by government, a shift from a purely private sector led to a public sector-driven productivity improvement program.

This chapter aims to determine the consequences of MPEX on productivity and product quality of beneficiary firms. It examines how *Kaizen* practices contribute toward this end.

2 LITERATURE REVIEW

2.1 Kaizen

Ohno (1988, 123–177) classified *Kaizen* as either operations, equipment, or process *Kaizen*. Operations *Kaizen* refers to improvement of specific operations in the shop floor. Equipment *Kaizen* refers to improvements in the utilization and operation of existing equipment, while process *Kaizen* refers to the reinvention or restructuring of the overall production processes. In the context of the case studies, *Kaizen* refers to any of its three kinds. *Kaizen* is further anchored on the following assumptions: it (1) requires little investment especially in terms of equipment; (2) aims to reduce waste, overburden, and unevenness; and (3) is people oriented where the welfare and the empowerment of the workers are important.

2.1.1 *Kaizen as Not Physical Capital-Intensive*

Imai (1986, 25 as cited in Ohno et al. 2009, 6) characterizes *Kaizen*, among others, as requiring little investment but great effort to maintain. It requires great effort as it needs the involvement of everyone—managers and workers. The concept of little investment (Imai 2012) is consistent with Ohno's (1988) notion of improvement using existing equipment. While managerial capital may increase firm-level productivity, *Kaizen* is relevant only in initiatives that require little expense. An obvious question emerges on the threshold of little expense. This chapter resolves this question by identifying only those that did not require the acquisition of new equipment in the production system as *Kaizen* practices. The repurposing and modification of existing machinery or tools while involving certain expense can still fall under the rubric of Ohno's equipment *Kaizen*. While expense might be incurred in equipment *Kaizen*, the assumption is that such actions are implemented to reduce the cost or waste of operating existing machinery and the expense involved is lower than acquiring a new machinery.

2.1.2 *Kaizen as Reduction of Muda, Muri, and Mura*

Another distinctive feature of *Kaizen* is that it aims to reduce waste (*muda*), overburden (*muri*), and unevenness (*mura*). *Muda* is manifested as either defects, overproduction, waiting, non-used talent, transport, inventories, motion, and excess processing or downtime. *Muri* manifests when employees and processes are subjected to unnecessary stress due to the wrong tools, wrong metrics, and wrong fit, among others. *Mura* per-

tains to situations where processes are inconsistent with sudden upticks that lead to excess capacity in certain times. Any low-cost improvement that reduces *muda*, *muri*, and/or *mura* can then be considered as *Kaizen* depending on its effect to the workers.

2.1.3 *Kaizen as a People-Oriented Approach*

Sonobe and Otsuka (2014, 15) believe that *Kaizen* promotes inclusive development. *Kaizen* empowers not just the employers, but the employees as well. Because of instances when workers are more knowledgeable about the production, *Kaizen* encourages the workers to come up with strategies that could improve their work. It is inclusive such that aside from the owners earning more, but *Kaizen* extends this opportunity to the workers.

Waste reducing practices that require little investment implemented in firms cannot be considered to fall within the spirit of *Kaizen* if they do not empower or would result in situations inimical to the workers' safety and well-being like layoffs. On practical terms, *Kaizen*, as implemented, will need the full cooperation of workers to be successful. Workers will not be motivated to participate if its wastes reduction and its corresponding savings will result in layoffs. Japan's postwar experience was a demonstration of *Kaizen* where firms pursued wastes reduction without jeopardizing the welfare of workers as shown in Shimada (2017) in this volume.

2.2 *Factors Affecting Firm Growth*

There are numerous factors that contribute toward firm growth. Nichter and Goldmark (2009, 1453–1464) reviewed researches on firm growth and found four areas that are important: individual entrepreneur characteristics like education and related work experience; firm characteristics like age, formality, and access to finance; relational factors such as social network and value chain; and contextual factors like the business environment and the situation of the larger economy. Reeg (2013) follows the same categories but conceptualizes these areas as layers in her onion model where the individual (Kaplinsky 1995, 57–71) and firm characteristics are internal factors while relational and contextual factors are considered external. Kaplinsky's (1995, 57–71) findings on the challenges in the adoption of Japanese management techniques in developing countries also fall within those areas. He identified some of these external challenges as weakness of human resource development, problems in inter-firm relations, and management and labor-management relations.

In a study by Habidin and others (2016, 512–513), follow-up activities, work area impact, and employee skill and effort were identified as *Kaizen* activities that have positive relationship to operational performances.

2.3 *Kaizen and MSMEs*

Three factors for a successful *Kaizen* implementation were determined, namely effective communication between the management and employees, a clear firm strategy, policies, and goals, and the presence of a *Kaizen* champion who pilots the activities for continuous improvement (Maarof and Mahmud 2016, 522–531). In the study of Mano et al. (2014, 25–42), the trainings on *Kaizen* did not have a statistically significant effect on sales revenue. Instead, the effect was apparent on other value-adding parameters such as reduction in waste material and activities.

Aside from improvement in productivity and quality, the introduction of the *Kaizen* training as a bottom-up approach also improved the quality of working conditions and social capital of firms through increased employees' participation in the operation of firms and better relationship among workers (Shimada and Sonobe 2018, 21–22). It resulted in the improvement of workers' attitude toward work.

In Tanzania, *Kaizen* is one of the country's interventions supporting the growth of the manufacturing sector. According to Bwemelo (2014, 85–86), participating Small Scale Manufacturing Enterprises (SSME) perceive *Kaizen* to be useful and their implementation was effective, although challenges were encountered.

Kaizen, as adopted by Japan International Cooperation Agency (JICA), does not only improve productivity of the firms, its impacts ripple beyond it. It facilitates partnership with government agencies making them adopt a pro-productivity institutional thinking which creates pro-productivity policies and outcomes. On the sectoral level, firms that apply *Kaizen* processes increase productivity and expand their market share (Lemma 2018, 24).

3 DATA AND METHODOLOGY

3.1 *Data Sources*

MPEX was implemented in all regions since its inception in 1991 from the DOST central office through TAPI. In the last five years (2013–present),

however, the program was transferred to regional offices leading to uneven implementation depending on regional priorities. Based on consultations with regional directors, seven regions were considered: Region 3 (Central Luzon), Region 4-A (Calabarzon), Region 4-B (MIMAROPA), Region 6 (Western Visayas), Region 7 (Central Visayas), Region 8 (Eastern Visayas), and Region 13 (Caraga). Fieldwork pushed through in four regions (4-B, 6, 7, 8) where regional office personnel were available to assist in visiting beneficiary firms as shown in Fig. 13.1. From a population of about 300 MPEX food manufacturing beneficiaries mainly

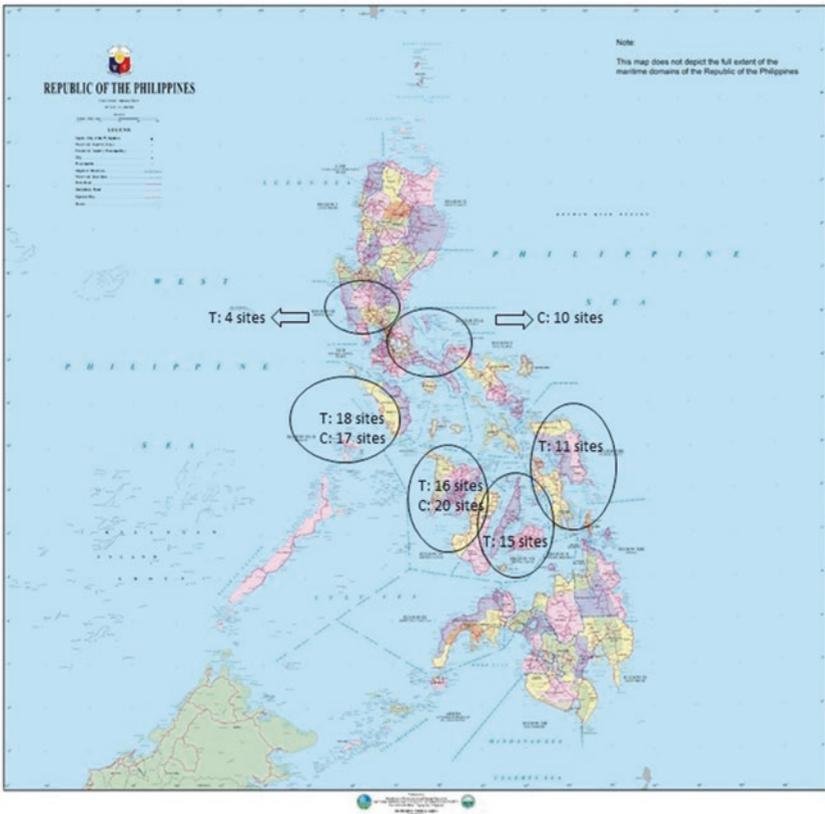


Fig. 13.1 Map of the Philippines showing the locations of respondent firms

in the bakery, cakes, and pastries sub-sector in the regions where MPEX was consistently implemented, 177 firms were culled. Seventy-four respondent firms were selected from the 177 sampling frame. They were surveyed using face-to-face interview and ocular inspection of the respondent's workplace, from September 2017 to January 2018. Of the 74 firms surveyed, 10 were eventually excluded because they were no longer operating or because of incomplete data. The remaining 64 respondent firms were analyzed. The other 113 firms were either too remote to visit, or unrelated to the bread, cakes, and pastries sub-sector, for example meat processing, catering, and others. For the comparison group, firms assisted by the Department of Trade and Industry (DTI) and those that availed of or currently applying for other DOST programs were interviewed. Forty-seven firms were surveyed from Region 6, Region 4-B, and Region 4-A (Rizal Province) from March 2018 to June 2018. Face-to-face interview with the owner/manager was conducted followed by physical inspection of the respondent's workplace. Their responses were mainly based on best memory recall.

3.2 *Method for Quantitative Analysis*

Propensity score matching (PSM) method was used to remove the bias that can be contributed by confounding variables. The propensity scores of the comparison and treatment groups were matched using the following time-invariant covariates: sex, firm age, capital, educational attainment of the *owner*, parents' engagement in business, firm's sales per worker before, and firm's workforce size before intervention. Evidences are shown in Sattar (2011, 64) for sex, Nichter and Goldmark (2009, 1453–1464) for educational attainment, Fadahunsi (2012, 108) for age, and Barringer et al. (2005, 666) for parents' involvement in business as entrepreneurial experience.

Difference-in-difference (DID) regression analysis was performed on the matched data to determine whether MPEX implementation results in change in outcomes namely sales per worker, workforce size, and number of product lines. Three DID models were used where each outcome variable was regressed against treatment type (treatment or comparison), time relative to MPEX implementation (before or after), and the interaction between treatment time and time relative to MPEX implementation.

3.3 *Method for Qualitative Analysis*

Two anonymized cases were examined to qualitatively identify and understand the contribution of *Kaizen* practices in firm performance. Specifically, the cases were selected based on reported positive outcomes including increase in productivity or product quality improvement, and cooperation of the owner. Representativeness was also considered in the choice of the two firms.

This qualitative analysis was done to supplement the findings from the quantitative analysis by providing context as to how observation of *Kaizen* practices is related to firm performance. Although findings may not be generalized, this analysis elucidated key insights regarding enabling conditions for *Kaizen* adoption and sustenance.

4 FINDINGS AND ANALYSIS

4.1 *Quantitative Findings: Propensity Score Matching and Difference-In-Difference Regression Analysis*

Out of the 64 treatment firms and 47 comparison firms, 35 were matched with a match tolerance of 0.25, using the Nearest Neighbor matching method with replacement. Preliminary analysis led to the selection of the following covariates: *sex, firm age, capital, parents' engagement in business, firm's sales per worker before, and firm's workforce size before intervention.*

DID regression analysis showed mixed results when relating number of product lines, sales per worker, and number of workers to the three regressors. Details of the results are discussed further in the Appendix.

The relatively small sample size, survey responses based on memory recall, and the confounding effects on productivity of other assistance received by the MPEX firms from other government agencies inherently restricted the results of the analysis.

A study by Bloom et al. (2013) looked into the effects of management practices to firm performance of large textile industries. The study had a relatively small sample size, 14 treatment plants and 6 control plants. The interventions resulted in an 11 percent increase in productivity, decentralization of decision-making, and increased use of technology. Despite the small sample size, the statistically significant results are attributed to the data quality. The data were collected directly from machine logs and was done in a high frequency.

While most interventions in the MPEX can be considered as embodiment of the *Kaizen* philosophy, the MPEX was not conceptualized as a *Kaizen* effort. Thus, attributing MPEX implementation with increase in product lines as *Kaizen* is not straightforward. Nonetheless, the treatment group was observed to have implemented *Kaizen* methods and approaches after MPEX enrollment. About 35 percent of the firms implemented food safety and good manufacturing practices, 23 percent layout changes, 21 percent 5S and housekeeping improvement, 13 percent materials and inventory management, 13 percent process and operations efficiency, 10 percent equipment/machine upgrade, 8 percent worker/staff development/training, and 6 percent financial and recordkeeping improvement actions. Not all of the recommendations were fully implemented primarily because most of the owners' time was consumed running the enterprise and managing the daily operations (76 percent). They also have multiple responsibilities—marketing, operations and production, finance, procurement, and general management. They could not find time to delegate and involve workers in making decisions. Another reason cited was the inability to access funds to implement the improvement recommendations.

4.2 *Qualitative Findings: Comparative Case Study*

Two case studies were done to explore positive indications of relationship between *Kaizen* practices and firm-level productivity and/or product quality improvement. Each case study is organized into three parts: background of the firm; the practices embodying *Kaizen* philosophy; the productivity or product quality improvement observed in the firm; and a discussion of the insights from the case analysis.

To demonstrate how *Kaizen* practices as defined by Ohno (1988) work within specific cases, the following case studies trace how they contribute toward productivity and improved quality by achieving at least one of the four purposes of improvement: easier, better, faster, cheaper (Shingo 1988, 94). The cases chosen demonstrate at least two pathways through which *Kaizen* practices bring positive outcomes to the firms. These are faster processes and better quality through compliance with regulatory standards.

4.2.1 Firm A: *Kaizen Increases Productivity*

Background

Firm A, a single proprietorship, started operating as a home-based business in 2011. It sells assorted bread and cakes through an outlet and 20 deliveries within the city. It is a small enterprise with an asset size of about US \$100,000. After two years of operation, the bakeshop transferred to a bigger 600-square meter plant. With a large market, it increased its outlets to 4 and supplied 36 schools. The bakeshop employs 24 bakers and a couple of administrative and finance staff.

In 2015, it availed of the MPEX program of the DOST. The MPEX consultant from a local college gave six recommendations namely:

1. Re-layout plant to minimize the risks of contamination and for systematic arrangement of work areas.
2. Replace rice hull burners with new ovens.
3. Purchase additional equipment for line balancing: one unit of spiral dough mixer (45 kg capacity) and one-unit dough roller (27 kg capacity).
4. Require all personnel to pass through the sanitary area before going to their workplaces and technical personnel to observe good manufacturing practices (GMP) inside the production area.
5. Benchmark the design of baked products of other bakeshops.
6. Benchmark the labels of baked products of other bakeshops.

Of the six recommendations, Recommendations 1 and 4 can be considered as *Kaizen* as they aim to reduce motion waste, waiting and possible defects like contamination, and do not require additional equipment. Both are also beneficial to the workers and require their sustained effort and cooperation to be realized. Recommendations 2 and 3 are capital-intensive and may not be considered pure *Kaizen* if they require buying new equipment. Recommendations 5 and 6 are marketing-related with minimal effect on the production process. The owner decided to implement Recommendations 1, 2, and 4. For Recommendation 2, the rice hull burners were replaced with new electric ovens by availing a government loan facility.

***Kaizen* Practices Introduced**

The MPEX consultant conducted a half-day training to employees before implementing Recommendations 1 and 4. The training focused on 5S and good manufacturing practices/hygiene. As a result, the owner modified the layout and the practices of the firm. Implemented practices due to the MPEX recommendations were as follows:

1. Pre-mix ingredients a day before production. Previously, bakers themselves gather and mix ingredients on the production day. Skilled bakers were freed from the mundane act of measuring and mixing ingredients, giving them more time to spend on high-value activities like preparing the dough itself. It also prevented possible unavailability or shortage of raw materials, which could delay the production process, because required ingredients were already pre-mixed the day before.
2. Reduce the frequency of raw material delivery from once to twice a week giving them more time to pay for acquired ingredients, which they source from suppliers under a 45-day credit term. This practice did not only reduce waste, it also reduced the burden on the bakers.
3. Re-layout the existing machines according to their sequence in the production process. This reduced the distance and time traveled by the material thereby eliminating transportation waste.
4. Provide sanitary area before entering the facility to prevent contamination entering the production area.

Aside from those recommended by the consultant, additional *Kaizen* practices were also introduced by the entrepreneur, signifying adoption of the continuous improvement mindset.

One practice implemented by the owner was promoting teamwork. The production workers were grouped into two teams. Given the same production quota, the two teams engaged in a healthy daily competition of finishing the job first. Workers may leave once the quota is reached. Every fortnight, the team with the most number of wins gets US \$40 bonus. This setup provides an additional incentive and introduced fun through gamification in the workplace. More importantly, it encouraged the workers to be more efficient.

Suggestions were also encouraged. Workers recommended the use of long tables instead of several short ones in the production area. This reduced the effort required to move the molded bread and shortened the

move time. With long tables, trays are just pushed near the next sequence of the production process.

The entrepreneur also introduced changes in the deployment of workers for the piling of packed bread for delivery. Before, three workers pile packed breads in crates for delivery at night. This system, however, overburdened the workers and delayed the delivery. In the new system, one works during the day to immediately pile packed bread in crates and the other two work at night to pile any remaining packed bread and load the crates for delivery. The practice reduced the burden among the firm's employees, reducing *muri*, while making the process faster.

Reckoning Productivity

The *Kaizen* practices introduced, however, cannot fully account for the faster process. Other interventions had a bigger effect on the production process. These are replacing the rice hull ovens with electric ovens and the use of electric heater for proofing instead of charcoal proofing. When using rice hull oven, it took two and a half hours to bake 32 plates (an average of 0.66 kg of flour per plate). With the use of electric ovens, 36 plates can be baked in just 25 minutes. As for the heater, it takes only an hour for the dough to rise. With charcoal proofing, it took twice as much time. Overall, there has been a reduction of at least 3 hours and 5 minutes in the production of 36 plates of bread. Considering that the electric oven has 12.5 percent more capacity compared to the rice hull oven, production capacity is further increased.

Before MPEX, 18 bakers and 6 on-the-job trainees (OJTs) were able to process 1260 kilos of flour for 14 to 15 hours. Each baker was given a quota of 60 kilos, while OJTs were given 30 kilos. After MPEX, there are still 24 bakers with the 6 OJTs absorbed as regular employees. Each has a quota of 60 kilos, which translates to 1440 kilos processed for 10 hours daily. Given that the non-*Kaizen* intervention can account for decrease three hours in production time, it can be inferred that further reduction of production time by one hour can be attributed to the *Kaizen* practices implemented. The increase in oven capacity by 12.5 percent is absorbed by the increase in volume of production from 1260 to 1440 kilos, an increase of 14.2 percent.

Considering that their monthly utility costs is US \$1060 for electricity and US \$1378 for gas, a one-hour reduction could translate to savings of approximately US \$4.60/day in gas and US \$3.50/day in electricity (assuming that production is daily at ten hours per day). In four years,

these amounts could pay for 80 percent of the loan amount used to acquire new equipment (US \$22,383). The intervention did not only make the process efficient, it also made it cheaper. Also, a one-hour reduction in production is important given the market situation. The earlier the deliveries are made, the sooner the bread gets sold for the day.

Lessons on *Kaizen* and Productivity

The case of Firm A indicates that from the *Kaizen* approaches introduced by the MPEX consultant, the entrepreneur was able to follow through with continuous improvements causing a change in the mindset of the workers. This eventually resulted in increase in productivity that was also confounded by the acquiring of more efficient machineries.

The market pressure for breads to be delivered early and on time and the need for the entrepreneur for free time to attend to his other businesses acted as catalyst in facilitating the adoption and implementation of *Kaizen* practices that resulted in significant productivity improvement in Firm A. Additionally, as evidenced by Firm A, *Kaizen* anchors higher-order productivity and quality with the adoption of better production technology and equipment.

4.2.2 Firm B: Kaizen Enhances Quality Through Compliance with Regulatory Standards

Background

Firm B is a micro enterprise, originally set up as a single proprietorship with an asset size of US \$40,000. It is engaged in condiments manufacturing. His business started back in 2013 when his application for distributorship to a major condiment manufacturer was met with onerous conditions. Instead of accepting the conditionalities, he formulated his own vinegar-based condiment, a mixture of natural fermented coconut sap, chilies, and other spices. The experimental vinegar got positive feedback from his friends which emboldened him to turn it into a business venture.

In 2016, he availed of the MPEX program. The MPEX consultants gave the following recommendations to improve his working area:

1. Mechanize certain processes including the chopping of spices and the filling, bottling, and sealing of condiments;

2. Institute hygienic practices including the non-use of cellphone inside the production area, putting a locker area to store personal belongings, proper flooring material and design, and re-location of the restroom outside the building;
3. Re-layout the production area to ensure continuous one-way flow of raw materials; and
4. Produce only one product at a time to ensure traceability.

The recommendations focusing on good manufacturing practices were implemented as a requirement to acquire a license to operate (LTO) from the Food and Drug Administration of the Philippines. An LTO is needed to secure a certificate of product registration (CPR) for a specific product. The CPR, in turn, is a requirement for major supermarkets before they agree to sell certain products.

The overall intervention including the purchase of machines resulted in a tenfold increase in production and sales. The purchase of a bigger blender, miller, and acetator allowed them to process a bigger volume of raw materials. The freezer enabled them to store perishable chilies when there is abundance in supply. The stainless tables and three-sink basin also facilitated their compliance with the LTO standards.

***Kaizen* Practices**

In firm B, it is difficult to fully attribute increase in productivity to process optimization given the reconfiguration and expansion of the production area. One reconfiguration entailed a separate point of entry for raw materials and a separate point of exit for the finished product. There were also hygienic practices introduced to ensure that the raw materials are not contaminated therefore minimizing losses. However, it is difficult to ascertain any gains in productivity unless a detailed time and motion study is conducted. Their production schedule is dependent on the demand of the customers. Spoilage is not a problem because raw materials are not perishable. The owner, however, attested that production became easier after the reconfiguration of the plant layout.

Another important indicator for the presence of *Kaizen* in the firm is the empowerment of workers to run the operations of the firm and suggest innovations. Due to the multiple commitments of the owner, the workers were empowered to process orders from clients as long as the transactions are recorded. Also, the owner transformed the firm from single proprietorship to a corporation. He announced that he will eventually give stock options to his employees to encourage them to perform better.

Reckoning Quality Enhancement

The interventions especially in hygiene and the systematization of the production process allowed them to comply with the LTO standards which opened doors to bigger markets like groceries and major supermarkets. Access to new market would not have been possible without the LTO from the Food and Drug Administration. While it is difficult to quantitatively demonstrate the effect of *Kaizen* practices in the licensing process, the good practices that the employees imbibed were necessary in complying with the requirements for the LTO acquisition and granted them access to bigger markets.

It is also worth emphasizing that the decision to secure a license to operate is necessary for the firm's viability. Firm B's products are condiments. In order to attain a certain viable volume, the firm needs to expand its market reach. While Firm B is operating in a city of about a hundred thousand people, the demand is not enough to support the firm given the presence of competitors and the nature of the product. In order to be profitable, the firm needs to expand its market beyond the city and its environs, thus the need to secure an LTO.

Lessons on *Kaizen* and Quality Toward Regulatory Compliance

Increase in firm-level productivity of Firm B could not be directly assumed because of the presence of *Kaizen* practices in the workplace. However, adapting 5S, improvement in process flow, and upgrade in equipment as a part of regulatory compliance allowed the firm to have access on a bigger market. This is also consistent with the findings on the significant effect of *Kaizen* in expanding markets (Lemma 2018, 24).

Similar to Firm A, Firm B's adoption of *Kaizen* practices is driven by the need of the owner to unload some work given multiple commitments. 5S discipline gives more confidence on the manager that the firm will operate well given the established processes and practices. However, the main drive for upgrade is the requirement of the market and the market requirement of the firm. Both reinforce each other and determine whether quality upgrade driven by 5S practices is necessary.

4.2.3 Discussion of Cases

Managerial capital upgrade can be done through the enlistment of management consultant like what was done in Mexico (Bruhn et al. 2010, 629–633) and India (Bloom et al. 2013). However, increased managerial

capital, it is argued, is mediated by at least two factors before certain practices are adopted. These factors include the demand of the market and the market requirement of the firm's products. Given these factors, it is possible to classify firms into at least four categories depending upon their situation: (1) demanding market environment and market scale requirement, (2) demanding market but market scale not a requirement, (3) non-demanding market and market scale requirement, and (4) non-demanding market and market scale not a requirement. Type 1 firms are more likely to adopt best practices including *Kaizen* practices because of their viability depends on meeting both the market requirement and a certain scale of the market. Type 2 firms will adopt *Kaizen* practices as practicable if it satisfies the market requirement. Type 3 firms will adopt *Kaizen* practices to expand. Type 4 firms are less likely to adopt *Kaizen* practices as there is no pressure to do so.

Based on the cases discussed above, the kind of market the business serves could influence the adoption of practices especially if adoption entails some costs. For those business requiring a license to operate (LTO) from the Food and Drugs Administration to be viable, they need to follow the recommendations especially those related to food safety and proper setup of the production area. But in cases where the market is not demanding, the recommendations may be foregone or partly implemented unless the owner deems it to be beneficial either financially or in the case studies above to reduce supervision time. In the case of Firm, A, although they can operate without an LTO, they still choose to implement the recommendations as these are beneficial to their business and reduce supervision time. But other beneficiaries did not fully implement the recommendations because the market that they serve does not demand those changes.

Hampel-Milagrosa (2014) in her study on upgrading of Philippine enterprises emphasized the importance of the entrepreneur in business upgrading. While entrepreneurial mindset is indeed important, they are more likely to implement best practices especially *Kaizen* (low-cost) practices if it is beneficial for them. Entrepreneurs are rational utility maximizing individuals who want to maximize the gains for their business. Thus, any recommendation (e.g., system waste reduction) may not be readily accepted if the cost is incurred without readily translatable significant pecuniary impact on the business.

The demands of the market could be either regulation- or customer-driven. Regulatory demands are standards imposed by government regulatory agencies that need to be complied with. The regulatory regime enforced by the Food and Drug Administration for food manufacturers is an example of this regulatory demand. To get a license to operate, the firm needs to implement good manufacturing practices which include elements of 5S. In terms of employee welfare, micro enterprises in the Philippines (those with capitalization under US \$60,000) are exempted from the minimum wage law reducing the leverage of workers.

For most food manufacturers, regulatory demands need to be complied to access a larger market. Regulatory- and consumer-driven demands are thus interrelated. There are, however, small businesses with a small market that operate even without an LTO, only business registration and permits from the local government. They usually supply only the locality including gift and souvenir shops where tourists buy. Given the small volume of demand, production is usually not continuous based only on demand and can be met by relatively inefficient processes. Customer-driven demands are present in urban areas where the market is more crowded compared to rural areas where competition is not that tough.

5 CONCLUSION AND POLICY RECOMMENDATIONS

MPEX, a public-instigated productivity and quality improvement program directed toward MSME firm-level productivity and quality improvement, was shown to exhibit *Kaizen* applications, mindsets, methods, and practices, albeit not originally packaged or advertised as *Kaizen*.

However, due to the respondent's reliance on memory recall data and the difficulty in isolating the confounding effects of the other programs and various assistance to the MPEX firms, the study was unable to establish significant difference in productivity improvement and quality enhancement measured in terms of the number of workers and sales per worker after MPEX.

The study also underscored the role of the entrepreneur/manager in implementing *Kaizen* in MSMEs, consistent with the finding of Hampel-Milagrosa (2014) that the entrepreneur is a necessary and sufficient condition for enterprise upgrading. As shown in the case studies, the

successful implementation of *Kaizen* hinges on the mindset, entrepreneurial propensity, managerial capital, and time management of the entrepreneur. Engagement and empowerment of workers were demonstrated in both cases. Regulatory compliance and customer demand requirements and entrepreneurial needs for managerial efficiency and time were catalysts for facilitating, adopting, and sustaining *Kaizen* implementation. Further study is needed to establish definitive causal relationships of *Kaizen* applications to different categories of MSMES based on objective data.

The following are some policy recommendations to improve MPEX implementation.

1. *Introduce a Kaizen learning module in MPEX to entrench the Kaizen mindset and mastery among the entrepreneurs and their workers.*

This will make *Kaizen* as a natural guide for the entrepreneurs and the workers.

2. *Integrate MPEX in the SET-UP program.*

Based on the profile of the MPEX treatment firms, 88 percent of them availed of SET-UP and 72 percent of the firms availed of SET-UP before MPEX. Integrating them will eliminate redundancies and sharpen the focus on empowering the MPEX entrepreneur improve productivity and quality. Additionally, a simplified technology needs assessment (TNA) which is a requirement for SET-UP can likewise be melded in the integrated MPEX-SETUP program.

3. *Establish the Kaizen Institute in partnership with universities especially with public universities.*

The Kaizen Institute will facilitate the inculcation of *Kaizen* principles and practices in industries and the public sector. DOST can simply expand their existing partnerships with different universities, particularly outside Metro Manila to establish the Kaizen Institute that will provide knowledge and know-how, training, joint undertakings, action research, and development on *Kaizen* that will improve productivity, quality, safety, cost, morale, and environment on a sustained basis.

APPENDIX: QUANTITATIVE ANALYSIS AND RESULTS

Methodology

Propensity Score Matching was conducted in three steps—(1) Preliminary Analysis to determine the covariates that are likely to influence balance of data; (2) Estimating the propensity scores to ensure that groups are balanced; and (3) Propensity Score Matching using Nearest Neighbor method with replacement and a caliper of 0.25 (Olmos and Govindasamy 2015). In the preliminary analysis, two approaches were taken to select variables that were included in the final model. The first was an estimation of the normalized difference (i.e., difference between control and treatment group for each variable) (Imbens and Wooldridge 2009). Covariates with absolute scores greater than 25 percent were not included. This was followed by the method suggested by Hansen and Bowers (2008), resembling an omnibus test.

Three difference-in-difference models were used where each outcome variable was regressed against treatment type (treatment or comparison), time relative to MPEX implementation (before or after), and the interaction between treatment time and time relative to MPEX implementation. The model is mathematically shown in Eq. (13.1).

$$y_{ist}^{OUTCOME} = \beta_0 + \beta_{Group} Group_{is} + \beta_{Prd} Period_{it} + \beta_{Group \times Period} (Group_{is} \times Period_{it}) + e_{ist}, \quad (13.1)$$

where

$y_{ist}^{OUTCOME}$ is the

OUTCOME \in No.of Product Lines, Gross Sales per Worker
and No.of Workers

of firm i in group $s \in$ Treatment, Comparison for period t After MPEX,
Before MPEX

$Group_{is}$ is the dummy for the group type, equal to 1 if $s =$ Treatment and 0
if $s =$ Comparison

$Period_{it}$ is period, equal to 1 if $t =$ After MPEX and 0 if $t =$ Before MPEX

β_0 is the average outcome

β_{Group} accounts for the average permanent difference between treatment
and control groups

β_{Prd} captures the outcome time trends common to both treatment and control group

$\beta_{Group \times Period}$ captures the true effect of MPEX on firms, which is what we are interested in.

The description of the outcome variables is summarized in Table 13.1.

Results

DID regression analysis relating to number of product lines and MPEX implementation shows that, at 5 percent significance level, there is enough statistical evidence to indicate that there is average permanent difference between treatment and comparison groups, with treatment group having about six products more than the comparison group. However, the coefficients for *Period* and *Interaction* were not found to be significant, indicating that there is not enough statistical evidence to show that MPEX implementation caused a change in number of product lines (Table 13.2).

Meanwhile, all coefficients in the DID regression analyses for *Sales per worker* and *Number of workers* were not found to be significant. These

Table 13.1 Description of outcome variables used in the difference-in-difference regression model

<i>Variable</i>	<i>Description</i>
Sales per worker	Total declared sales divided by number of declared workers
Number of workers	Number of declared regular workers plus seasonal hires prorated according to number of months engaged by the firm
Number of product lines	Number of products being produced by the firm

Table 13.2 Difference-in-differences regression models results

<i>Regressors</i>	<i>1. No. of product lines</i>	<i>2. Sales per worker</i>	<i>3. No. of workers</i>
Group	5.9**	80,936	-1.0
Period	1.2	151,971	3.4
Interaction	-0.1	8750	-1.5

** : significant at p -value, $\alpha = 0.05$

results indicate that MPEX implementation did not cause change for both *Sales per worker* and *Number of workers*.

In the unmatched treatment group, the correlation between asset size and difference in sales before and after MPEX implementation is 0.760. It can be speculated that as asset size increases, firms become more capable of implementing changes that will result in increase in sales. This can be investigated further.

REFERENCES

- Badiru, A.B., and J.J.-G. Chen. 1992. IEs Help Transform Industrial Productivity and Quality in Taiwan. *Industrial Engineering* 24 (6): 53–55.
- Barringer, Bruce R., Foard F. Jones, and Donald Neubaum. 2005. A Quantitative Content Analysis of the Characteristics of Rapid-Growth Firms and Their Founders. *Journal of Business Venturing* 20: 663–687.
- Bloom, Nicholas, Benn Eifert, Aprajit Mahajan, David McKenzie, and John Roberts. 2013. Does Management Matter? Evidence from India. *The Quarterly Journal of Economics* 128 (1, Feb.): 1–51.
- Bruhn, Miriam, Dean Karlan, and Antoinette Schoar. 2010. What Capital Is Missing in Developing Countries? *American Economic Review* 100 (2, May): 629–633.
- Bwemelo, Gordian. 2014. KAIZEN as a Strategy for Improving SSMEs' Performance: Assessing its Acceptability and Feasibility in Tanzania. *European Journal of Business and Management* 6: 79–90.
- DOST. 2009. *Memorandum Circular No. 4, s. 2009*. Memorandum Circular, Manila: DOST.
- Fadahunsi, Akin. 2012. The Growth of Small Businesses: Towards A Research Agenda. *American Journal of Economics and Business Administration* 1: 105–115.
- Habidin, Nurul Fadly, Hamisah Hassan, Suzaituladwini Hashim, Sharon Yong Yee Ong, and Nursyazwani Mohd Fuzi. 2016. The Relationship between Kaizen Event and Operational Performance in Malaysian Automotive SMEs. *International Journal of Academic Research in Business and Social Sciences* 6: 504–517.
- Hampel-Milagrosa, Aimée. 2014. *Micro and Small Enterprise Upgrading in The Philippines: The Role of the Entrepreneur, Enterprise, Networks and Business Environment*. Bonn: Deutsches Institut für Entwicklungspolitik (DIE).
- Hansen, B.B., and J. Bowers. 2008. Covariate Balance in Simple, Stratified and Clustered Comparative Studies. *Statistical Science* 23 (2): 219–263. <https://doi.org/10.1214/08-STS254>.
- Imai, Masaaki. 1986. *Kaizen: The Key to Japan's Competitive Success*. New York: McGraw-Hill Publishing Company.

- . 2012. *Gemba Kaizen: A Commonsense Approach to a Continuous Improvement Strategy*. New York: McGraw-Hill.
- Imbens, G.W., and J.M. Wooldridge. 2009. Recent Developments in the Econometrics of Program Evaluation. *Journal of Economic Literature* 47 (10): 5–86. <https://doi.org/10.1257/jel.47.1.5>.
- Jeppesen, Soeren. 2005. Enhancing Competitiveness and Securing Equitable Development: Can Small, Micro, and Medium-Sized Enterprises (SMEs) Do the Trick? *Development in Practice* 15 (3/4, June): 463–474.
- Kaplinsky, Raphael. 1995. Technique and System: The Spread of Japanese Management Techniques to Developing Countries. *World Development* 23 (1, Jan.): 57–71.
- Lemma, Alberto. 2018. The Role of Kaizen in Economic Transformation. *Working Paper*. London: Overseas Development Institute.
- Maarof, Mohd G., and Fatimah Mahmud. 2016. A Review of Contributing Factors and Challenges in Implementing Kaizen in Small and Medium Enterprises. *Procedia Economics and Finance* 35: 522–531.
- Mano, Yukichi, John Akoten, Yutaka Yoshino, and Tetsushi Sonobe. 2014. Teaching KAIZEN to Small Business Owners: An Experiment in a Metalworking Cluster in Nairobi. *Journal of the Japanese and International Economies* 33: 25–42.
- Nichter, Simeon, and Lara Goldmark. 2009. Small Firm Growth in Developing Countries. *World Development* 37 (9, Sep.): 1453–1464.
- Ohno, Izumi, Kenichi Ohno, and Sayoko Uesu. 2009. Introduction. In *Introducing KAIZEN in Africa*, ed. GRIPS Development Forum, 1–12. Tokyo: GRIPS Development Forum.
- Ohno, Taichi. 1988. *Workplace Management*. New York: Productivity Press.
- Olmos, Antonio, and Priyalatha Govindasamy. 2015. Propensity Scores: A Practical Introduction Using R. *Journal of Multidisciplinary Evaluation* 11 (25): 68–88.
- Reeg, Caroline. 2013. Micro, Small and Medium Enterprise Upgrading in Low-And Middle-Income Countries: A Literature Review. *Discussion Paper*. Bonn: Bonn: German Development Institute.
- Sattar, Sarosh. 2011. *Opportunities for Men and Women: Emerging Europe and Central Asia*. World Bank.
- Shimada, Go, and Tetsushi Sonobe. 2018. Impacts of Kaizen Management on Workers: Evidence from the Central America and Caribbean Region. *Working Paper*. JICA.
- Shingo, Shigeo. 1988. *Non-Stock Production: The Shingo System of Continuous Improvement*. Boca Raton, FL: CRC Press.
- Sonobe, Tetsushi, and Keiji Otsuka. 2014. *Cluster-Based Industrial Development: KAIZEN Management for MSE Growth in Developing Countries*. Basingstoke and New York: Palgrave Macmillan.

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