Soft Skills, Hard Results

The Productivity Impact of On-The-Job Soft Skills Training, with Focus on Women

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Soft Skills, Hard Results: The Productivity Impact of On-The-Job Soft Skills Training, with Focus on Women

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1. INTRODUCTION

The textile industry is a critical pillar of employment and economic activity in many developing economies, particularly for women. The sector has long served as an entry point into the labor market for female workers, offering them formal employment opportunities in countries where labor market participation remains constrained by cultural and structural barriers (ILO, 2022). Women make up between two-thirds and three-quarters of the global textile and garment workforce, yet they often face systematic disadvantages in wages, career progression, and skill development (UNIDO, 2023). This highlights the urgent need for interventions that not only improve firm-level productivity but also empower female workers through skill acquisition and career advancement.

However, the textile and garment industry remains highly vulnerable to productivity constraints. Despite its labor-intensive nature, the sector is often characterized by low wages, high worker turnover, and limited investment in human capital (UNU, 2024). As a result, firms struggle with inefficiencies, while workers—particularly women—find themselves trapped in low-wage, repetitive tasks with little opportunity for skill advancement (Andersson et al., 2018). This stagnation is further compounded by the "LON" production system, dominant in many textile/garment-producing economies, in which local firms operate under tight contracts from foreign buyers, leaving little room for investments in productivity-enhancing training (ILO, 2022).

Given the reliance of the textile and garment sector on female labor, understanding the relationship between training, productivity, and gender-specific outcomes is crucial. Existing literature highlights the importance of non-cognitive skills (soft skills) in driving productivity improvements across industries (Deming, 2015; Bassi & Nansamba, 2017; Adhvaryu et al., 2018). Soft skills—such as communication, teamwork, time management, and leadership—enable workers to better coordinate with colleagues, anticipate workflow bottlenecks, and handle workplace stress more effectively. These abilities are especially valuable in team-based manufacturing environments, where production lines require seamless interaction between workers to maintain efficiency.

From a theoretical perspective, interventions to improve labor productivity in the textile and garment industry are grounded in Becker's (1964) Human Capital Theory, which posits that education and training contribute to higher productivity. While Becker's framework does not explicitly distinguish between hard and soft skills, it lays the foundation for considering various skill types—both technical and interpersonal—as critical investments in human capital. The literature has evolved, giving increasing attention to non-cognitive abilities such as emotional intelligence, communication,

conflict management, teamwork, and stress management, all of which are now recognized as equally important for productivity improvement.

Building on this, Heckman et al. (2006) argue that non-cognitive skills expand the traditional understanding of labor market signaling as initially proposed by Spence (1973). Education not only signals cognitive ability but also conveys a broader set of behavioral and interpersonal competencies, which are integral to labor market success. In industries where automation and technology are progressively replacing routine tasks, soft skills have become increasingly crucial for maintaining job stability and employability (Deming, 2015). Extensive research corroborates the link between non-cognitive skills and improved earnings, job retention, and productivity (Borghans et al., 2008; Lindqvist & Vestman, 2011; Montalvao et al., 2017; Adhvaryu et al., 2018). Notably, studies (Bassi & Nansamba, 2017; Adhvaryu et al., 2018; Acevedo et al., 2017) demonstrate that teamwork, leadership, problem-solving, communication, and time management are crucial predictors of labor market success, both at the individual and firm level.

Despite this, most existing studies on labor productivity focus on technical skills rather than soft skills (Barron et al., 1999; Konings & Vanormelingen, 2015). In developing countries, where low education levels and skill gaps are common among textile workers, the marginal productivity gains from soft skills training may be even higher. Furthermore, while prior research has shown that soft skills training improves job retention and wages (Acevedo et al., 2017; IFC, 2009), there is little experimental evidence on its direct impact on productivity—especially in the textile industry.

A key knowledge gap remains in understanding how women-specific barriers influence the effectiveness of training interventions. Women in textile factories often juggle work with household responsibilities, leading to higher absenteeism and greater exposure to workplace stress (ILO, 2019). If soft skills training enhances stress management, teamwork, and goal-setting, it may offer disproportionately larger benefits to female workers, thereby reducing gender disparities in productivity. However, few studies have empirically tested whether such interventions differentially affect male and female workers, making this a crucial area for investigation.

This paper seeks to answer the following research question: Does soft skills training improve labor productivity in the textile industry, and does this effect differ by gender? Using a randomized controlled trial (RCT) in North Macedonia's textile industry, we provide causal evidence on the impact of non-cognitive skill development on worker productivity.

North Macedonia presents a unique setting for this study. The country's textile industry has traditionally been a significant employer of women, yet it has faced workers' aging, skill shortages, and high worker turnover in recent years (Petreski, 2022). With an average textile wage below the national mean, many workers face limited incentives for upskilling, leading to persistent inefficiencies. The "LON" production model, which dominates the sector, further exacerbates this issue by limiting firms' incentives to

invest in workforce development (Zhezhova et al., 2020). Given these structural constraints, introducing a targeted soft skills training program presents a promising opportunity to test whether low-cost human capital investments can enhance firm-level productivity while improving worker outcomes—particularly for women.

This study builds on and extends previous literature in several ways. First, unlike observational studies that suffer from self-selection bias, we implement an RCT to provide causal estimates of training effects. This follows the rigorous methodology of Adhvaryu et al. (2018), who used a randomized design to measure training effects in the textile industry, but we extend their work to a new geographic and industry context. Second, while prior research has demonstrated the productivity benefits of technical training (Konings & Vanormelingen, 2015), we focus on non-cognitive skills, which have received less attention in manufacturing settings. Our study tests whether improvements in teamwork, communication, and stress management can translate into quantifiable efficiency gains.

We explicitly examine whether women benefit more from soft skills training than men. Given the work-life balance challenges faced by female textile workers (ILO, 2019), we hypothesize that women may experience larger productivity gains if training helps them manage workplace challenges more effectively. While studies on soft skills and productivity have largely focused on high-income countries (Deming, 2015), we examine a developing economy, where the returns to training may be higher due to the lower baseline skill levels of workers.

The remainder of the paper is structured as follows. Section 2 provides background on the North Macedonian textile, discussing its economic significance, workforce composition, and structural challenges. Section 3 outlines the experimental design, detailing the soft skills training program, participant selection, and randomization approach. Section 4 presents data sources and key variables. Section 5 describes the empirical strategy and estimation techniques. Section 6 presents the main results, including overall productivity effects, gender differences, and heterogeneity analysis. Section 7 discusses policy implications and concludes.

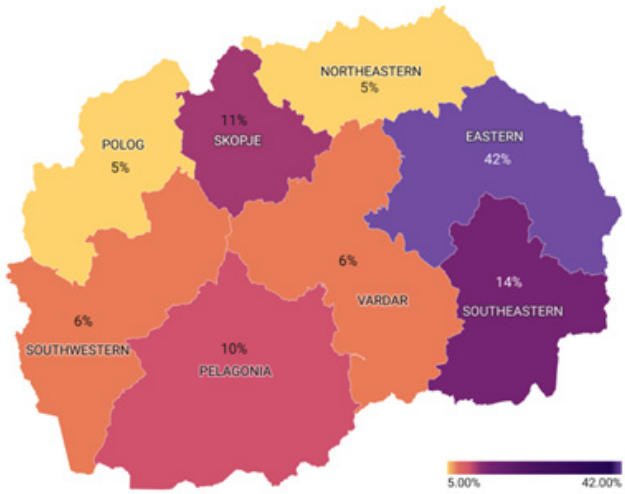
By addressing gaps in the existing literature and using a rigorous experimental approach, this study provides new insights into the role of soft skills in enhancing productivity and reducing gender disparities in the textile industry. Our findings have direct policy relevance for firms, industry stakeholders, and governments seeking to design cost-effective training programs that boost both firm competitiveness and female worker empowerment.

2. THE TEXTILE INDUSTRY IN NORTH MACEDONIA

2.1 Some Stylized Facts

Textile industry in North Macedonia remains a non-trivial pillar of the country's economy, contributing to GDP, employment, and exports in an important fashion. In 2022, it accounted for 6% of total manufacturing value added.[1] It is comprised of 205 enterprises classified as textile manufacturers (Zhezhova et al., 2020). Most of the enterprises are classified as small, about 50% (between 10 and 49 employees), 35% are medium (50 and 249 employees) and the rest are large. Figure 1 depicts the geographic distribution of the textile industry: most of the companies are based in the Eastern region (MON, 2017), which positions it – with the main hub the city of Shtip – as the home of the textile industry in North Macedonia.[2]

Figure 1. Geographical distribution of textile industry



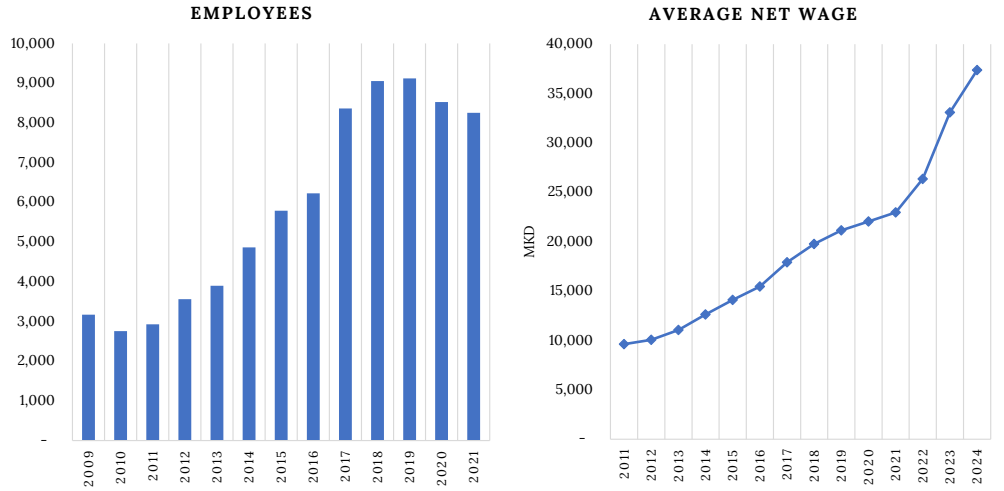
Source: State Statistical Office / Ministry of Education.

Structurally, the industry is dominated by the "LON" production system, whereby foreign contractors supply raw materials or semi-finished goods and local manufacturers execute the final stages of production—such as sewing, assembling, and packaging (Zhezhova et al., 2020). The LON model enables market access and initial cost competitiveness, it likely also contributes to constraining industry's capacity for value added – exposing it to global demand and pricing trends, including competition from Asian textile giants (ILO, 2022).

1 Other two related industries include wearing apparel (9%) and leather and related products (1%), but they are not subject to analysis here.
2 This distribution, however, covers both textile and wearing apparel industries.

The textile industry in North Macedonia is a labor-intensive sector, employing approximately 8,000 workers in 2022, equivalent to 1.2% of the country's total employment and 6% of all manufacturing jobs (Figure 2, left). The industry maintains an average wage which is about 80% of the national average wage. Yet, it is higher than the national minimum wage (Figure 2, right). Historically, North Macedonia introduced its first minimum wage policy in 2012, initially set at 39% of the average wage across industries, but only 30% for textiles, leather, and apparel—reflecting the industry's traditionally lower wage levels. It was only in 2017 that the minimum wage was aligned in the textiles, leather, and apparel with the national average. Petreski and Mojsoska (2017, Table 5) find that before the large 2017 increase of the minimum wage, approximately 26% of workers in the three industries were minimum wage earners, while after the increase, this figure increased to more than a third.[3] Yet, attenuating wage disparities does not solve the underlying productivity challenges. This, coupled with labor migration policies like those facilitating access to work in Germany or seasonal work in regional countries like Croatia, is a major challenge for the industry. The outflow, alongside the inability to retrain workers, exacerbates the skill shortages and hinders the industry's ability to adapt and improve productivity of workers (CoC, 2020). However, Figure 2 testifies improvements in the textile industry in the country in these two critical indicators.

Figure 2. Number of employees and wage dynamics in the textile industry

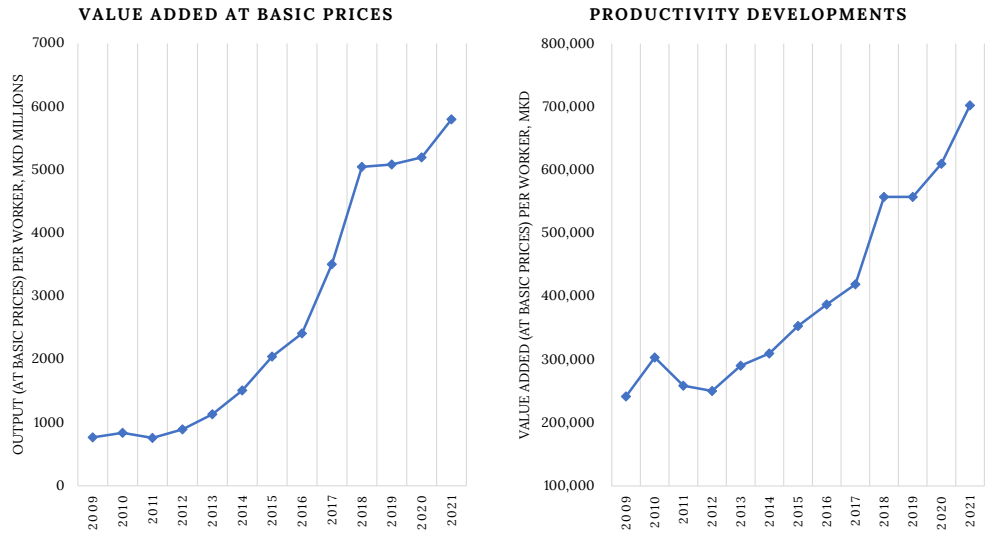


Source: UNIDO / State Statistical Office.

3 The analysis finds that increasing of the minimum wage results in bunching of workers around the new level of the minimum wage, which may be particularly the case in the textile, wearing apparel and leather industries. After 2017, the minimum wage was regularly adjusted with the cost of living, however, in 2021, another large ad-hoc increase occurred. However, the consequences (overall and for the textile industry in particular), have not been examined rigorously since then, and the outcome is not clear, as such increases have been concurrent with the persistent labor shortages on the market which worked to push wages upward.

The textile industry exhibited notable shifts in value added and productivity over the years (Figure 3). There have been strong upward trends in both value added and productivity developments over time. From 2009 to around 2015, the increases were gradual, but post-2015, there was a significant acceleration in growth. The steep rise from 2016 onward suggests improvements in efficiency, investment in technology, or structural changes within the industry. The plateau around 2018-2019 could indicate stabilization, but the continued growth afterward highlights resilience and sustained productivity gains.

Figure 3. Value added and productivity of the textile industry in North Macedonia



Source: UNIDO.

Textile industry's export has been steadily rising over the years: in 2010, it was valued $619.9 million, rising to $704 million in 2021 (Figure 4, left). Most of the product is exported to Germany, United Kingdom, Turkey, Serbia and Greece (WITS, 2022). However, over the observed period of time, total industrial production and export from North Macedonia highly proliferated, mainly due to the policy to attract and retain multinational companies in the free economic zones. Hence, in relative terms, the textile industry's export has been on the decline. The reduced export share is also partially explained by increased competitiveness from other markets that have been faster to adopt automation and offer more competitively priced ready-made garments. Additionally, the structure of the industry with respect of firm size, further hinders the ability to introduce technological changes. Thus, while the industry remains inherently export-oriented, its relative position within the total export basket has changed.

2.2 The Production Process in Comfy Angel

Our intervention was implemented at Comfy Angel, a textile factory with 800 employees located in Prilep, North Macedonia, specializing in the production of bedding textiles: pillows, duvets, bed linens, and mattress protectors. Founded in 2004 as a joint Anglo-Macedonian limited liability company, the company became fully domestic in 2023 following the buyout of the English capital. The company operates across more than 30,000 m^2 of space, including production facilities, warehouses, and administrative offices. Comfy Angel has a weekly production capacity of 100,000 duvets and 200,000 pillows, making it one of the largest companies in Southeast Europe within this industry.

The factory is organized into 10 sectors: production and planning, operations, sales, procurement, finance, development, warehouse and logistics, transport and customs, legal affairs, human resources, and quality control. The "production and planning" sector is the subject of this study, as it generates the core value in the company, and labor productivity is normed only in this sector. The production process is organized in phases: cutting, sewing, and packaging. It is divided into 7 production units: two for duvets, and one each for pillows, bags, bedding, protectors, and semi-finished products. Each production unit is divided into production lines, each responsible for producing a specific type of bedding.

Each production line is further divided into smaller groups of operations, with each group responsible for assembling parts of the product (e.g., pillow covers, duvet covers, or mattress protector covers). These groups are separated by "feed points," where pre-prepared materials are fed into batches. For instance, one batch may contain enough fabric for 30 pillow covers or 20 duvet covers, which is then input into one station, while another station receives filling materials for 50 duvets.

This structured setup, with multiple feed points and material batches, is common in the textile industry. It allows for the separation of productivity between neighboring operations, providing flexibility for workload redistribution across the line when needed. Once each part of the product is completed (e.g., sewing pillow covers or filling duvets), the semi-finished products are transferred between machine operators, continuing along the line where additional operations, such as sewing, filling, and finishing, are performed.

At the end of the production line, the finished products, such as filled pillows or sewn bed linens, are transferred to the final processing department. In this department, the products are quality checked, ironed if necessary, and packaged for distribution. While most quality control is performed during production, the final check is conducted in this phase to ensure the products meet the standards before packing. Any defective products are sent back for rework, or if unrepairable, discarded before final packaging. Once the products are checked and packed, they are prepared for delivery.

Each production unit has five work positions/operators: seamstress, cutter, service operator, packaging operator, and machine operator. However, within each production unit, there are workers who are not part of the production lines but serve multiple lines with the daily work dynamic (i.e., moving between lines as needed). The positions/operators are described as follows:

- **Seamstress:** Responsible for cutting materials according to patterns or designs, preparing them for sewing. Ensures that materials are precisely cut to minimize waste and meet production standards.
- **Sewing operator:** Sew products according to design specifications, ensuring that the finished items meet quality standards.
- **Packaging Operator:** Handles the final packaging of finished textile products. Ensures that items are properly packed, labeled, and ready for shipping or storage.
- **Machine Operator:** Operates and monitors the textile machines involved in production. Ensures that machines are functioning properly and performs routine maintenance or minor repairs.
- **Service Operator:** Delivers materials to the seamstresses or packaging operators.

The norming process at Comfy Angel begins with measuring the time required to perform operations by trained operators who are well-versed in the work method and machinery. The measurement is performed on several pieces (10-20) to calculate the average time per piece, to which additional time is added (15% for small sewing machines and packaging, 5% or 3% for other machines). These percentages are added to cover unforeseen delays, excluding machine defects. Additionally, depending on the process, time is added for activities such as changing rolls, threading, and similar tasks. This results in the so-called normed time. The measurements are recorded in work studies, which contain data on the operation time, work order, operator, machine, and other relevant details. When operators master the process, a re-measurement and norm adjustment is done. Measurements are conducted periodically or when process changes occur to ensure precision and compliance with the norms for each operation.

Productivity is normed for the following three operators: seamstress, packaging operator, and machine operator. Daily logs are used to track the work done by the operators. Data from these logs are entered into Microsoft Dynamic NAV to calculate the daily performance of employees, which is then used for salary and bonuses calculations and for generating performance reports, which are distributed to various management sectors. Thus, daily logs serve as the basis for monitoring worker productivity.

3. PROGRAM AND EXPERIMENT DESIGN

3.1. Training Program on Soft Skills

The intervention program implemented in this study – named Excellence and Personal Development Program (EPeDeP) – is motivated by the Personal Advancement & Career Enhancement (PACE) program, developed by the well-known textile brand Gap, Inc. This program primarily targets female textile workers, particularly those with low incomes, aiming to unlock their potential by equipping them with essential skills to maximize their career growth—both in the workplace and in their personal lives. The program seeks to strengthen women's economic empowerment. Critical to note, except for the public available information, we had no any access to P.A.C.E.'s training materials or technical content, and therefore the content design of EPeDeP is strictly our own.

The full EPeDeP program consists of 40 hours of training delivered over 12 weeks, from mid-September 2024 to end of 2024. It is structured into five modules: **Time and Stress Management (7.5 hours), Communication (8 hours), Execution with Excellence (8 hours), Problem-Solving and Decision-Making (7.5 hours), Leadership and Team Building (7 hours), and a Final Session (2 hours).** A detailed breakdown of the modules is provided in Table 1. Each module is conducted over three days across two consecutive weeks (2+1 days). The training takes place at the workplace after regular working hours, and workers receive compensation for their participation, with this information communicated to them upon selection.

Table 1. Module Summary Table

Module	Description	Duration
Time and Stress Management	Equips participants with tools for effective time management and stress coping strategies. The focus is on goal setting, prioritization techniques, and stress management strategies to enhance both personal and professional productivity.	7.5 hours
Communication	Helps participants develop communication skills through practical exercises. The module emphasizes assertiveness, giving and receiving feedback, and improving interactions across different hierarchical levels.	8 hours
Execution with Excellence	Enhances task execution and teamwork skills with a focus on motivation, workflow optimization, and maintaining high standards. Participants engage in case studies and activities that strengthen both individual and team performance.	8 hours
Problem-Solving and Decision-Making	Sharpens analytical and decision-making skills using real-life scenarios to build practical problem-solving abilities in various situations.	7.5 hours
Leadership and Team Building	Encourages leadership development and collaboration through activities exploring leadership styles, team dynamics, trust-building, and fostering diversity in high-performing teams.	7 hours

In the textile industry, these skills play a crucial role in enhancing productivity and efficiency on the factory floor. Since production is often structured around team-based workflows, workers must possess strong communication skills to coordinate seamlessly with their teammates. Effective communication enables them to quickly identify and address bottlenecks in the production line, ensuring a steady throughput. Additionally, workers must be able to relay important information to supervisors in a clear and constructive manner, such as reporting machine malfunctions, requesting assistance to complete tasks, or coordinating breaks without disrupting the workflow. Beyond communication, workers need the ability to set personal goals, plan their tasks, and prioritize effectively to stay motivated and meet both hourly and daily production targets. The fast-paced nature of the industry also requires problem-solving skills to handle unexpected disruptions in production, whether due to technical failures, supply chain delays, or other operational challenges.

3.2. Experiment Design

Eligible participants for the program include all workers in the production sector whose daily productivity is measured, and who have a set target (norm), provided they were employed at **Comfi Angel** at the beginning of September 2024, i.e. prior to the intervention. The participants were selected from a list of eligible workers (a total of 350). The **treatment group** consists of 54 workers.

The random selection process was conducted in two stages (Figure 4).

1. **First Stage:** Three out of seven production units were randomly selected.

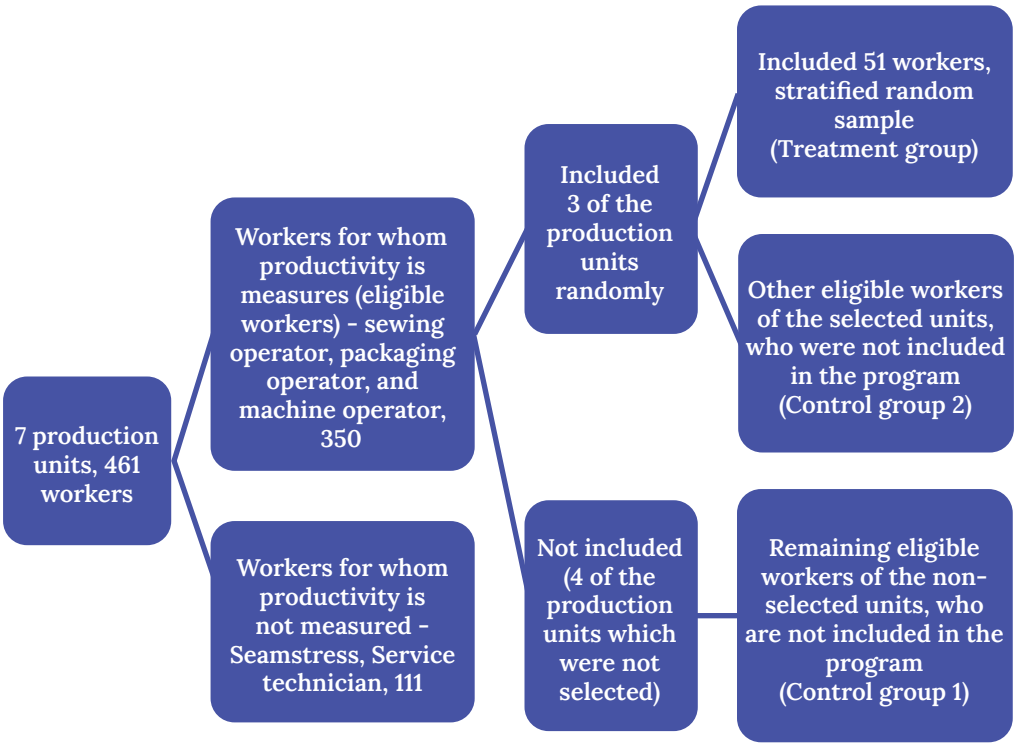
2. **Second Stage:** Within the selected production units, 54 workers were randomly chosen, stratified by job position: **sewing operator, packaging operator, and machine operator.**

The remaining workers were assigned to two control groups:

- **Control Group 1 (Primary Control):** Workers from production units that were not selected for the intervention.

- **Control Group 2 (Spillover Control):** Workers from selected production units who were not chosen to participate in the program.

Figure 4. Design of the experiment



The timeline for the intervention and data collection is as follows:

- **September 2024 (Start):** Distribution of the survey for data collection; collection of baseline survey data (before the program).
- **September 2024 (Around the 10th):** Notification about the program and selection of the treatment group.
- **September 2024 (Third Week):** Start of the program.
- **December 2024 (End):** End of the program.
- **February 2025:** Distribution of the survey for data collection; collection of follow-up survey data (after the program).
- **March 2025:** The company shares the administrative data collected for the period from January 2024 to February 2025.

4. DATA AND VARIABLES

4.1. Key Metric on Productivity

The key outcome of interest in our intervention is worker's productivity at his/her workplace. The following is how productivity at Comfy Angel is normed and recorded.

Through the process of establishing the norm (see section 2.2), the normed time is obtained. This is a measure of how many minutes are required to complete a specific type of product. For example, a pillow with a normed time of 10 is expected to take 10 minutes to produce one complete unit.

The normed time for performing each operation serves as the basis for calculating the target quantity. For a given production time unit, the target quantity is equal to that time (e.g., one hour) divided by the normed time. For example, the target quantity to be produced on the production line within one hour for a pillow with a normalized time of 10 would be 60/10 = 6 pillows per hour.

Productivity is measured through efficiency, i.e., the number of produced units relative to the target quantity, on a daily basis, expressed in percentage, according to reports from daily production sheets. The efficiency at the plant level on a given day is equal to the average efficiency at the worker level for that day. Since our analysis considers productivity at the monthly level, we further adjust this measure to account for differences in hours worked during the month. Instead of using raw productivity values, we estimate predicted probabilities of productivity based on the relationship between productivity and hours worked. This allows us to obtain an expected measure of productivity that accounts for variations in labor input. Specifically, we use these predicted probabilities to normalize productivity, ensuring comparability across workers regardless of differences in hours worked. By relying on predicted rather than observed productivity, we mitigate distortions arising from fluctuations in working hours and ensure that the measured differences in productivity more accurately reflect efficiency rather than variations in labor input.

4.2. Administrative Data

The data for this evaluation are drawn from two sources: *administrative data for each worker and a worker survey* conducted before and after the intervention. Each employee has been anonymized with an identification code (so called NAV number).

Administrative data are collected for the period from January 2024 to February 2025. The list of indicators extracted from administrative data includes:

a. Administrative data varying/measured on a daily basis, though aggregated as monthly sums or averages:

- **Productivity:** A key outcome measure assessed through efficiency, i.e., the percentage of the target norm achieved (see Section 4.1), averaged over month, corrected for the total number of hours worked during the month.
- **Hours worked: D**aily hours worked aggregated at the monthly level.
- **Attendance:** Daily presence at the workplace aggregated at the monthly level;
- **Tardy:** Absence from the workplace as fraction of the working day (delayed, earlier leave etc.), total hours monthly.

b. Administrative data varying/measured on a monthly basis:

- **Salary:** Net base salary plus supplement for unused sick leave plus supplement for target achievement.
- **Sickness leave:** Monthly number of hours, as full days per month, used as sickness leave.
- **Annual leave:** Monthly number of hours, as full days per month, used as annual leave.

c. Administrative data that do not vary or are considered non-variabledue to the relatively short duration of the intervention (as of September 2024):

- **General demographic characteristics of the worker:** Gender, age, place of residence.
- **Work experience:** Total years of work experience, work experience at Comfi Angel (month and year of employment).
- **Job-related data:** Type of contract (fixed-term, permanent), job position (cutter, seamstress, etc.), production unit.
- **Retention:** Whether the worker is still employed at Comfi Angel as of March 1, 2025; if not, the date they left the job.

4.3. Survey Data

The survey data are collected at two time points: before the intervention begins (September 1–10, 2024) and after the intervention ends (February 10–20, 2025). The survey questionnaires are completed by all workers involved in the intervention as well as those in the control group.

The survey is self-administered, with physical copies distributed to each worker, allowing them to complete it within a few days. Workers are encouraged to take the questionnaire home, fill it out in a quiet setting at their own pace, and return it to the workplace. This approach ensures that responses to questions about attitudes, feelings, behaviors, and perspectives are more reliable.

The purpose of the survey is to collect data on how personal characteristics, mental health, and risk attitudes influence workers' jobs and lives. More specifically:

- The **personal characteristics** section includes questions on conscientiousness, extroversion, locus of control, resilience, and independence.
- The **mental health** section examines aspects such as hope, optimism, and self-esteem.
- The survey also includes questions related to the **psychological distress scale (K10),** covering fatigue, nervousness, calmness, hopelessness, restlessness, depression, effort, sadness, and irresponsibility.
- This section concludes with questions on **risk and time preferences.**

The company's management provided input on its content before implementation.

4.4. Baseline Balance Checks

Table 2 provides a baseline balance checks for interest in skill development, participation in social programs, age, gender, school-level completed, if the person has children, years of tenure at the firm, and type of contract; all before the commencement of the treatment. The primary goal of comparing pre-treatment characteristics is to check whether the treatment and control groups are balanced on observables, which helps assess the validity of randomization. The average worker in the sample is approximately 46 years old, with about two thirds being women, with dominance of secondary educational level, and with a tenure of 7-8 years at Comfy Angel.

The summary statistics and comparisons presented in Table 2 pertain specifically to the direct treatment comparison, of both the basic control group and the control group with potential spillover effects. The analysis finds no statistically significant differences between the treatment and

control groups in any of these baseline observable indicators, as we fail to reject the null hypothesis of equal means. Moreover, we run a Hotelling T-square test to jointly test whether the means of multiple pre-treatment characteristics differ between the treatment and control groups, which provides a p-value of 0.5801 (primary control group) and 0.8951 (spillover control group), which does not provide any strong grounds to reject H0: Vectors of means are equal for the two groups. This means that since the statistical tests show no meaningful differences between the treatment and control groups before the intervention, we can conclude that they were already similar due to the randomization process. As a result, we do not need to apply additional statistical techniques to make the groups more comparable.

Table 2. Comparison statistics across groups

	Treated		Control Primary				Control Spillover			
	Mean	SD	Mean	SD	Mean Diff.	**p-value**	Mean	SD	Mean Diff.	**p-value**
Interest in skill development programs (1 = not interested to 5 = fully interested)	3.13	1.30	3.05	1.34	-0.07	**0.77**	3.10	1.36	-0.03	**0.92**
Have you ever participated in a program for social support? (1 = yes)	0.19	0.40	0.14	0.34	-0.06	**0.39**	0.16	0.37	-0.04	**0.61**
Age (years)	46.51	9.93	46.61	9.24	0.09	**0.96**	46.63	9.05	0.12	**0.95**
Gender (1 = woman)	0.68	0.47	0.64	0.48	-0.05	**0.59**	0.72	0.45	0.03	**0.69**
Education (1 to 9 scale, ISCED)	6.65	1.08	6.32	1.39	-0.33	**0.17**	6.44	1.23	-0.21	**0.33**
Do you have children (1 = yes)	0.80	0.40	0.86	0.35	0.06	**0.37**	0.88	0.33	0.07	**0.26**
Years of tenure in the factory	8.30	6.87	6.57	5.49	-1.72	**0.10**	6.94	5.78	-1.36	**0.22**
Type of contract (1 = indefinite)	1.32	0.47	1.41	0.49	0.09	**0.29**	1.37	0.49	0.05	**0.53**

Source: Authors' calculations.

5. EMPIRICAL STRATEGY

5.1. Statistical model and estimators

To estimate the impact of the treatment on the outcome variables, we use a fixed-effects difference-in-difference regression model that accounts for within-group variations over time. The model is specified as follows:

$$outcome_{it}=\alpha_0+\beta_1 treat_{it}+\beta_2\, during_{it}+\beta_3 after_{it}+\beta_4 treat\_during_{it}+\beta_5 treat\_after_{it}+\eta_i+\varepsilon_{it} \quad (1)$$

Where:

- $outcome_{it}$ is the outcome variable of interest for individual i at time t. Our key outcome variable is productivity, while the additional outcomes include salary, presence indicators as well as a battery outcomes related to personal preferences, mental health and psychological traits.

- $treat_{it}$ is a binary treatment indicator variable that equals 1 if individual i is in the treatment group at time t, and 0 otherwise.

- $during_{it}$ is a binary variable that equals 1 for the months of the intervention (September 2024 – December 2024), and 0 otherwise.

- $after_{it}$ is a binary variable that equals 1 if the observation occurs after the treatment is applied (January and February 2025), and 0 otherwise.

- $treat\_during_{it}$ is the interaction term between the treatment and the time of the intervention duration.

- $treat\_after_{it}$ is the interaction term between the treatment and post-treatment variables, capturing the differential impact of the treatment.

- η_i is the individual fixed effect, which controls for time-invariant unobserved heterogeneity across individuals or groups.

- ε_{it} is the error term, assumed to be independently and identically distributed.

Our key interest lies in the coefficient β_5, which captures the causal impact of the treatment, i.e. of the EPeDeP. It is to be noted that for the productivity, salary and presence-on-the-workplace specifications, we use monthly observations for the January 2024 – February 2025 period; while for the outcomes based on the survey, we use two points in time: September 2024 (pre-program) and February 2025 (post-program). Hence, for these estimates, coefficients for the 'during' period are not available.

For the dependent variables measuring productivity and salary, the fixed-effects (FE) estimator is used, which controls for individual-specific, time-invariant characteristics by removing the heterogeneity across individuals that does not vary over time. This allows us to focus on the within-individual variation over time. Due to the FE specification, the coefficient on $treat_{it}$ will be "wiped out" (i.e., omitted) because it is perfectly collinear with the fixed effects at the individual or group level. This leaves the interaction term $treat\_after_{it}$ as the main source of variation for estimating the treatment effect.

For the dependent variables measuring tardiness, annual leave and sickness days, which contain a large proportion of zeros—since most workers were not absent for the majority of the time—we use a Poisson regression model with fixed effects. The Poisson estimator is well-suited for count data, particularly in cases where the outcome variable is non-negative and includes many zero values. This approach allows us to appropriately model the distribution of absence and sickness time while maintaining consistency with the fixed-effects framework. Standard errors are clustered at the production unit level. Although the treatment was randomly assigned at two levels, we report clustering at the unit level to be more conservative in estimating the confidence intervals.

5.2. Correction for attrition

Despite our intervention lasted in total five months, textile factory in an inner town with very low level of unemployment is faced with quite dynamic workers' turnover. Based on treatment, selective observation may happen due to attrition, hence imposing some bias in our estimates. Attrition refers to the loss of participants from the study over time, and if it occurs differently across treatment and control groups, it could skew the results. Between the time of announcement (September 2024) and post-intervention measurement (February 2025), there has been one dropout from the treatment group (2%) and 19 dropouts from the control group (6.4%). Moreover, for the administrative data, there have been certainly workers who joined the company later than our data-collection starting point in January 2024. To test and account for this potential bias, we estimate the equation (1) in which the outcome variable is a dummy which takes a value of 1 if the worker i has been present in the factory at time t. We obtain the following result:

$$\widehat{present}_{it} = -0.89 - 0.27^{**} treat_{it} + 0.10during_{it} - 0.45after_{it} + 0.51treat\_during_{it} + 0.83^{***} treat\_after_{it} \quad (2)$$

, ** and * refer to statistical significance at the 10%, 5% and 1% level of significance. Standard errors robust for heteroskedasticity and clustered at the production unit level. Individual and time fixed effects included.*

We find some evidence of significant impacts on retention after training, as the coefficient on $treat\_after_{it}$ is statistically significant, despite the rest of the coefficients remain largely insignificant. The results speak that there is some present effect onto the size or composition of retained workers over the observed period.

Therefore, we weight treatment and control groups by the probability of being observed at any intermediate point in the data. We begin by estimating the probability that a worker is observed in the sample at any given point in time. This is done using a probit regression similar to but slightly simpler than (2):

$$retained_{it}=\alpha_0+\beta_1 treat_{it}+\sum\gamma_t\, Month_t+\delta BaseChar_t+\eta_i+\varepsilon_{it} \qquad (3)$$

Whereby: $Month_t$ is month fixed effects to account for time trends; $BaseChar_t$ includes the worker's characteristics: gender, tenure, age, position and type of contract; and the rest are as before. We use the inverse of the predicted probabilities from (3) as weights in the outcome regressions (1). The idea is that individuals with a higher probability of being observed (e.g., those with more stable characteristics or higher retention) are given more weight in the analysis, while individuals with a lower probability (e.g., those more likely to drop out) are given less weight. This method, inspired by Wooldridge (2010), adjusts for differential attrition and possible heterogeneous treatment effects based on worker characteristics, ensuring that the analysis provides accurate estimates of the treatment effects.

6. RESULTS AND DISCUSSION

6.1. Productivity impacts

The key results about intervention's effect on productivity are presented in Table 3. Treated workers are more efficient during the program (relative to the period before the treatment commencement) by 1.13%, and after the program by 0.4%. The former effect is the same, no matter which control group is used, while the latter effect is slightly larger (0.41%) when the primary control group is used (as opposed to 0.39% when the spillover control group is used). These productivity gains are solely attributable to EPeDeP intervention.

Apparently, the observed productivity gains—1.13% during the program and 0.4% after the program—indicate that the intervention had a sustained, albeit diminishing, effect over time. During the program, workers gained new soft skills, improved work processes, increased motivation or adopted more efficient work habits, leading to the observed productivity increase. The lower but still positive post-program effect suggests that some of the efficiency gains persisted after the program ended. This persistence may stem from retained knowledge and improved work habits, but the decline in impact could be due to diminished reinforcement (e.g., lack of continued training, supervision, or motivation). It may also be due to the short-observed period post-treatment in our case.

The identical impact of the program across different control groups shows that the increase in productivity is directly due to EPeDeP, not outside influences. The slight difference in post-program effects (0.41% vs. 0.39%) suggests that any spillover effects are minimal and do not change the overall conclusion.

Women experienced slightly larger efficiency gains from the intervention, with a statistically significant increase to 0.43% when compared to the primary control group. This suggests that female workers may have been particularly responsive to the program, possibly due to initial skill gaps that allowed for greater improvements, a stronger adaptability to structured training, or higher motivation driven by social or economic factors.

Results further reveal that there are no statistically significant differences in the salary due to the intervention. This indicates that productivity improvements did not translate into immediate wage increases. This could be due to fixed wage structures, labor market rigidities, or employer wage-setting policies that do not directly reward short-term productivity boosts, particularly given we observe these changes over a short period of time.

Table 3. Impact of EPeDeP on productivity and salary

	ALL		WOMEN	
	Productivity	**Salary**	**Productivity**	**Salary**
			All control	
Treated during the intervention	0.0113***	-0.0158	0.0111***	-0.0113
	(0.000)	(0.016)	(0.000)	(0.023)
Treated after the intervention	0.00399***	0.00314	0.00411***	0.0141
	(0.000)	(0.017)	(0.000)	(0.020)
			Primary control	
Treated during the intervention	0.0113***	-0.0158	0.0111***	-0.0113
	(0.000)	(0.016)	(0.000)	(0.023)
Treated after the intervention	0.00406***	0.00454	0.00427***	0.0115
	(0.000)	(0.025)	(0.000)	(0.032)
			Spillover control	
Treated during the intervention	0.0113***	-0.0158	0.0111***	-0.0113
	(0.000)	(0.016)	(0.000)	(0.023)
Treated after the intervention	0.00391***	0.00161	0.00395***	0.0167
	(0.000)	(0.009)	(0.000)	(0.010)

*Source: Authors' calculations. *, ** and *** refer to statistical significance at the 10%, 5% and 1% level of significance. Standard errors provided in parentheses. Standard errors robust to heteroskedasticity and potential correlations within production units. Time and individual fixed effects used.*

Overall, these results highlight the effectiveness of the EPeDeP intervention in improving worker productivity, both during and after the program. The sustained, though diminishing, impact suggests that workers retained valuable skills and habits, reinforcing the long-term benefits of structured workplace interventions. The minimal spillover effects confirm that these gains can be directly attributed to the program. Notably, the larger productivity boost among women underscores the potential for such interventions to address skill gaps and enhance workforce inclusivity. These findings emphasize the importance of well-designed training programs in fostering lasting productivity improvements at the workplace, particularly among women.

6.2. Heterogenous productivity impacts by workers' characteristics

We next investigate the degree to which productivity gains from the intervention are heterogenous by a couple of observable characteristics. These are the following: education (primary or less; secondary; tertiary or more); marital status (married/partnership; single or other); age (15-39; 40-54; 55+) and whether the worker has children or not. Results are presented in Table 4. We present the results only for the primary control group, as the results for the spillover control group were quite similar.

The results confirm the main findings, as the productivity gains during and after the intervention remain largely stable across worker characteristics, with only slight variations. However, productivity gains accrued differently across education levels for women, whereas this pattern is less pronounced for men (columns 1 and 2). Notably, women with secondary education—the largest group in the factory—experienced an additional productivity increase of 0.2 percentage points over those with primary education, who saw a gain of 0.3%. Interestingly, these gains for women with secondary education materialized only after the intervention ended, suggesting that newly acquired skills or process improvements required more time to translate into measurable efficiency gains. In contrast, women with tertiary education benefited consistently throughout the intervention period and beyond, with a significantly larger post-intervention gain of over 0.7 percentage points, far exceeding the during-intervention increment of 0.2 percentage points. This suggests that higher-educated workers were able to internalize and apply productivity-enhancing behaviors more efficiently, while those with lower education levels needed a longer adjustment period. The findings highlight the role of educational attainment in shaping how workers absorb and sustain productivity improvements, emphasizing the need for extended reinforcement and support when targeting lower-educated workers in training interventions.

Whether workers were married or not did not interfere with how the intervention affected productivity gains, as evidenced by columns (3) and (4) in Table 4. This suggests that marital status was not a determining factor in how individuals responded to the intervention. In contrast, age played a significant role in shaping productivity improvements, as shown in columns (5) and (6). Specifically, individuals over 40 benefited more than younger workers, with the effect being particularly strong when considering all workers collectively. While young workers experienced a post-intervention productivity gain of 0.24%, those above 40 saw an additional increase of 0.2 percentage points, indicating that older workers adapted more effectively or leveraged prior experience to sustain improvements. Moreover, age-related productivity gains during the intervention were more pronounced among women, with the effect being slightly stronger for older women, suggesting that they may have been particularly responsive to the intervention's structure or content.

Productivity gains from the intervention also varied based on whether workers had children (columns 7 and 8). Overall, workers with children experienced an additional post-intervention productivity gain of 0.15 percentage points, suggesting that parental responsibilities may have influenced how improvements were sustained over time. However, this effect was primarily driven by men, as the coefficient for women was statistically insignificant. In contrast, for women, having children significantly reduced productivity gains during the intervention, with a decline of 0.22 percentage points compared to child-free women. This suggests that competing demands from household responsibilities, including unpaid childcare and domestic work, may have limited their ability to fully engage with the program or implement productivity-enhancing changes in real time. Notably, women without children experienced a post-intervention productivity increase of 0.35%, indicating that fewer external constraints may have allowed them to better leverage the intervention's benefits. These findings highlight how unpaid care responsibilities can create barriers to workplace productivity improvements, particularly for women, underscoring the importance of policies that support work-life balance in maximizing the effectiveness of such programs.

Table 4. Impact of EPeDeP on productivity, by observable characteristics

		ALL	Women	ALL	Women	ALL	Women	ALL	Women
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Treated during the intervention		0.0107***	0.0105***	0.0111***	0.0110***	0.0104***	0.00979***	0.0113***	0.0132***
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)
Treated after the intervention		0.00367***	0.00283***	0.00424***	0.00431***	0.00244***	0.00326	0.00292***	0.00354***
		(0.000)	(0.001)	(0.000)	(0.000)	(0.000)	(0.002)	(0.000)	(0.001)
Education (ref. = Primary educated or less)	**Treated with secondary ed. during the intervention**	0.000666	0.000719						
		(0.000)	(0.001)						
	Treated with secondary ed. after the intervention	0.000358	0.00179*						
		(0.001)	(0.001)						
	Treated with tertiary ed. during the intervention	0.00246***	0.00235***						
		(0.000)	(0.000)						
	Treated with tertiary ed. after the intervention	0.00327	0.00722***						
			(0.001)						
Marital status (ref. = Single and others)	**Married treated during the intervention**			0.000321	0.000269				
				(0.000)	(0.000)				
	Married treated after the intervention			-9.5E-05	2.31E-05				
				(0.001)	(0.001)				
Age (ref. = Young (15-39))	**Treated (40-54) during the intervention**					0.000889***	0.00126***		
						(0.000)	(0.000)		
	Treated (40-54) after the intervention					0.00188***	0.00115		
						(0.000)	(0.002)		
	Treated (55+) during the intervention					0.00132***	0.00193***		
						(0.000)	(0.000)		
	Treated (55+) after the intervention					0.00186**	0.000786		
						(0.001)	(0.002)		
Has children or not	**Treated with children during the intervention**							-1.5E-05	-0.00223***
								(0.000)	(0.000)
	Treated with children after the intervention							0.00153***	0.00105
								(0.000)	(0.001)

*Source: Authors' calculations. *, ** and *** refer to statistical significance at the 10%, 5% and 1% level of significance. Standard errors provided in parentheses. Standard errors robust to heteroskedasticity and potential correlations within production units. Time and individual fixed effects used.*

6.3. Heterogenous productivity impacts by status and size of financial supplements

The company runs two financial supplement or bonus programs: one for non-usage of sickness days[4], and another to award well-performing workers. We investigate the degree to which productivity gains from the intervention are heterogenous by whether the worker received the bonus or not, and its size. Namely, we devise two dummy variables, assigning a value of 1 to workers who either received no bonus, or where the amount was below the median for the entire period.

Results presented in Table 5 validate our earlier findings with respect to the general impact of EPeDeP on productivity. Bonuses make some difference. The bonus awarded inversely to the number of sickness days used worked limitedly: in the full sample, treated individuals who did not get such bonus (meaning who were more prone to open 'sickness leave') acquired slightly higher productivity gain from the program (0.2 p.p.). This could mean that the program helped improve their engagement, skills, or work efficiency, compensating for previous absences. However, it might also suggest that those who already received incentives for attending work had less room for additional productivity improvement, as they were already performing consistently. The results are, however, of limited statistical significance.

On the other hand, treated individuals who received no or low performance bonus had higher productivity gain from the program. If the bonus structure primarily rewarded already high-performing individuals, those with low or no bonuses may have had more potential for growth, leading to larger productivity increases. The effect is particularly strong for women: after the program, their productivity added 0.5 p.p., suggesting that barriers to performance might not have been solely financial but also structural or skill-related. Overall, these results indicate that the program had a greater positive impact on workers who were not heavily incentivized by existing bonus structures, especially women. This could imply that the intervention helped address gaps that bonuses alone did not fill.

4 Inspired, inter alia, by anecdotal evidence that workers take 'sickness days' even when they are not sick, and this is prevalent during the late spring and summer, coinciding with the phases in agricultural production.

Table 5. Impact of EPeDeP on productivity, by bonus status and size

		Presence supplement		Performance supplement	
		ALL	Women	ALL	Women
Treated during the intervention		0.0109***	0.0109***	0.0101***	0.0103***
		(0.000)	(0.001)	(0.001)	(0.001)
Treated after the intervention		0.00351***	0.00371***	0.00196***	0.00253**
		(0.000)	(0.000)	(0.000)	(0.001)
Bonus against sickness leave	No or low receivers during the intervention	0.000923	-0.000534		
		(0.001)	(0.002)		
	No or low receivers after the intervention	0.00188*	0.00246		
		(0.001)	(0.001)		
Performance bonus	No or low receivers during the intervention			0.00248***	0.00166
				(0.000)	(0.001)
	No or low receivers after the intervention			0.00483***	0.00532***
				(0.000)	(0.000)

*Source: Authors' calculations. *, ** and *** refer to statistical significance at the 10%, 5% and 1% level of significance. Standard errors provided in parentheses. Standard errors robust to heteroskedasticity and potential correlations within production units. Time and individual fixed effects used.*

While the findings suggest that workers receiving low or no performance bonuses benefited more from the EPeDeP program, caution is needed in interpreting these results due to potential endogeneity between performance bonuses and productivity. Specifically, the possibility of reverse causality — where more productive workers are already receiving higher bonuses — complicates the interpretation of the relationship between bonuses and productivity gains. This raises the concern that the observed increase in productivity could be driven by inherent differences in worker performance rather than the program's effect. Additionally, the self-selection of workers into bonus categories may bias the results, as those with higher baseline productivity may be more likely to receive larger bonuses. These factors suggest that while the program appears to have a significant impact, further analysis using more advanced methods, such as instrumental variables, would be necessary.

6.4. Impact on workplace presence

Table 6 presents the results of the intervention for three workplace presence metrics: total hours of tardiness per month, days spent on sickness leave, and days taken as annual leave. Since these variables are heavily dominated by zeros, Poisson regression is used to estimate the effects. Overall, the results are statistically insignificant, suggesting that the intervention did not lead to significant changes in workers' attendance behavior.

However, two notable findings emerge. First, during the intervention, workers were less likely to take annual leave, which may indicate increased motivation and engagement with the skill development program. This aligns with other findings in the study, where workers demonstrated interest in acquiring new skills. The consistency of this result across both control groups suggests that no specific spillover effects influenced this behavior, reinforcing the idea that the reduction in leave was directly related to the intervention.

The second key result is that women exhibited increased tardiness, both during and after the intervention. Since tardiness is measured as a portion of working time per day, this finding suggests that the timing of the training sessions—conducted outside regular working hours—may have conflicted with women's domestic responsibilities, a finding related to the one in Section 6.2. As a result, the additional demands on their time could have led to delays in arriving at work or other forms of absenteeism. It is likely that this effect has been reinforced when women had children. More concerning is that this pattern persisted even after the intervention ended, implying that the time constraints imposed by the training may have had longer-term effects on their work routines. The precise reasons behind this trend, however, remain unclear and warrant further investigation to understand the broader implications for work-life balance and gender-specific constraints in workplace participation.

Table 6. Impact of EPeDeP on presence at the workplace

	ALL			WOMEN		
	Tardy	Sickness	Annual leave	Tardy	Sickness	Annual leave
			All control			
Treated during the intervention	0.299	-0.353	-0.434***	0.906***	0.141	-0.337***
	(0.324)	(0.521)	(0.099)	(0.224)	(0.568)	(0.118)
Treated after the intervention	0.407	0.216	0.0245	1.087***	0.752	0.00887
	(0.341)	(0.603)	(0.172)	(0.295)	(0.640)	(0.244)
			Primary control			
Treated during the intervention	0.299	-0.353	-0.434***	0.906***	0.141	-0.337***
	(0.324)	(0.521)	(0.099)	(0.224)	(0.568)	(0.118)
Treated after the intervention	0.411	0.239	0.0375	1.090***	0.783	-0.00613
	(0.354)	(0.597)	(0.179)	(0.319)	(0.630)	(0.250)
			Spillover control			
Treated during the intervention	0.299	-0.353	-0.434***	0.906***	0.141	-0.337***
	(0.324)	(0.521)	(0.099)	(0.224)	(0.568)	(0.118)
Treated after the intervention	0.402	0.166	0.00942	1.083***	0.689	0.0263
	(0.364)	(0.714)	(0.183)	(0.338)	(0.769)	(0.256)

*Source: Authors' calculations. *, ** and *** refer to statistical significance at the 10%, 5% and 1% level of significance. Standard errors provided in parentheses. Standard errors robust to heteroskedasticity and potential correlations within production units. Time and individual fixed effects used.*

6.5. Impact on personal preferences, mental health and psychological traits

We complement the findings based on administrative data with evidence from the survey of treatment and control workers on soft skills and personality traits, and estimates of treatment spillovers. We consider the impact of the program on survey outcomes that might plausibly reflect the skills taught by EPeDeP. We test whether the program impacted personality characteristics (conscientiousness, locus of control, perseverance, extraversion and self-sufficiency), mental health (mental distress), psychological stress (self-esteem, hope/optimism, etc.), risk and time preferences, and peer self-assessment. All of these could be thought of as the channels through which EPeDeP worked for workers' productivity.

We also include indicators about the interest to participate in future skill-development programs and about the perception of the benefit of the programs for improvement of own productivity.

Table 7 presents the impact of the intervention on key survey outcomes. Participants in the treatment group reported a significant increase in optimism (0.230 points overall, 0.314 for women; considered on a 1-5 scale), the effect being significant only when comparison is made with respect to the spillover control group. The coefficients suggest that optimism was improved by EPeDeP, but not shared among immediate colleagues through social interactions or shared expectations. On the other hand, the intervention's effect on positive self-perception did not show statistical significance, indicating that changes in personal confidence may have required more than just exposure to the program.

The intervention led to notable improvements in various psychological stressors, as the coefficients are negative for most of the aspects, though some are significant. The intervention contributed to a significant reduction in anxiety among women (-0.447 overall), and the effect is stronger when comparison is made to the primary control group. The slightly smaller negative coefficient in the case of the spillover control group may suggest a slight spillover effects, indicating that while the intervention directly helped women manage anxiety, some positive effects extended to their untreated female colleagues within the same unit, likely through shared experiences or support mechanisms.

The rest of the improvements in the psychological stress factors are observed with respect to the spillover control group. For example, the intervention led to a decline in feelings of extreme nervousness among women (-0.232). Similar positive results the program attained in the feeling of peacefulness, effort relief and joy, but the significance in some cases is limited and/or dissipates. These findings suggest that women particularly benefited in terms of stress reduction, possibly due to the intervention providing a sense of structure or reassurance. However, in all cases, the result is attained in comparison to the spillover control group. This could mean that the untreated colleagues in the selected units did not benefit from spillover effects—or possibly even felt worse due to social comparison or exclusion. They directly observed the improvements in those who received the intervention. If they felt left out or unfairly excluded, this might have led to negative emotions, counteracting any potential positive spillover effects.

An important effect of the intervention was a reduction in perceived control over life (-0.474 overall, -0.543 in the primary control group), suggesting that participants became more aware of external constraints. This effect was stronger and significant only in direct comparisons with the primary control group, indicating that spillover effects took place in this respect. This

suggests that while the intervention made participants more conscious of external limitations, it also influenced non-selected workers within treated units, leading to a broader workplace awareness of constraints on personal agency. Such a pattern implies that the intervention may have triggered discussions or reflections within work units, leading even those who were not directly selected to reconsider the extent to which they control their own circumstances.

The smaller effect for women (-0.410 in the primary control group) indicates that they were less affected by the shift in perceived control over life compared to men. This suggests that women may have already been more aware of external constraints prior to the intervention, making the program's impact on their perceptions more limited.

At the same time, a very significant but unexpected result is that the intervention reduced self-organization and responsibility among participants (-0.271 overall, -0.416 for women). This suggests that the program may have inadvertently altered participants' attitudes toward workplace autonomy, possibly by shifting their perception of structure and accountability. The negative effect is particularly pronounced when comparing treated workers to their co-workers within the same production units, as well as when focusing on women. This indicates that those directly exposed to the intervention became less inclined to self-manage their tasks, perhaps due to an increased reliance on external guidance or newly introduced support mechanisms.

The even stronger decline for women suggests that they may have been particularly sensitive to shifts in workplace expectations regarding autonomy and self-direction. One possible explanation is that the intervention altered their perception of personal responsibility, perhaps by emphasizing teamwork, external incentives, or a redistribution of tasks. If the program encouraged greater collaboration or reliance on managerial guidance, participants—especially women—may have become less inclined to independently manage their work, instead integrating more into collective decision-making structures. Additionally, as discussed in Sections 6.2 and 6.4, the program's structure and duration may have conflicted with women's unpaid domestic responsibilities, further straining their time and reducing their capacity for self-directed work, thereby reinforcing this effect.

The last significant and interesting finding is that female workers became more expectant of their productivity relative to peers from the same production unit (0.225 for women). This suggests that the intervention prompted perception of stronger own abilities, especially among women. While the finding is with limited significance, still the absence of it in the spillover group alludes to some spillover effect is spreading the positive attitude of own capacity to deliver at the workplace.

Table 7. Impact of EPeDeP on survey outcomes

	ALL control		Primary control		Spillover control	
	All	Women	All	Women	All	Women
			Mental health			
Optimistic	0.230**	0.314*	0.159	0.219	0.318*	0.413*
	(0.094)	(0.135)	(0.102)	(0.158)	(0.079)	(0.117)
Positive attitude for self	0.13	0.2	0.0325	0.0573	0.244	0.34
	(0.105)	(0.179)	(0.117)	(0.188)	(0.110)	(0.229)
			Psychological stress			
Tired	-0.067	-0.181	-0.119	-0.337	-0.00561	-0.024
	(0.189)	(0.339)	(0.170)	(0.356)	(0.261)	(0.356)
Nervous	0.136	0.0812	0.234**	0.158	0.0194	0.00304
	(0.072)	(0.128)	(0.074)	(0.121)	(0.091)	(0.184)
Too nervous	-0.159	-0.0994	-0.0199	0.0309	-0.325	-0.232**
	(0.111)	(0.145)	(0.078)	(0.161)	(0.175)	(0.048)
Hopeless	-0.177	-0.134	-0.164	-0.184	-0.193*	-0.0831
	(0.100)	(0.216)	(0.137)	(0.226)	(0.062)	(0.245)
Anxious	-0.204	-0.447**	-0.184	-0.482*	-0.228	-0.411**
	(0.176)	(0.135)	(0.249)	(0.197)	(0.109)	(0.091)
Unpeaceful	-0.244**	-0.228	-0.181	-0.224	-0.32	-0.231
	(0.075)	(0.141)	(0.123)	(0.209)	(0.111)	(0.084)
Depressive	0.0331	-0.0245	0.0182	-0.127	0.0509	0.0792
	(0.124)	(0.204)	(0.108)	(0.177)	(0.172)	(0.213)
Hard (needs effort)	-0.144	-0.242	-0.0589	-0.184	-0.246*	-0.302*
	(0.097)	(0.133)	(0.130)	(0.215)	(0.081)	(0.094)
Sad	-0.256**	-0.257	-0.167	-0.192	-0.359*	-0.322
	(0.104)	(0.129)	(0.100)	(0.133)	(0.115)	(0.122)
Worthless	0.0693	-0.111	0.0721	-0.115	0.0662	-0.107
	(0.152)	(0.153)	(0.156)	(0.179)	(0.177)	(0.159)
			Risk and time preferences			
Readiness for risk-taking	0.125	0.124	0.166	0.161	0.0777	0.0876
	(0.113)	(0.176)	(0.160)	(0.217)	(0.117)	(0.181)
Prefers large award in future than small award today	-0.0885	-0.0249	-0.0566	-0.0277	-0.124	-0.0222
	(0.135)	(0.244)	(0.211)	(0.375)	(0.060)	(0.161)

			Personal traits			
Organized and responsible	-0.271**	-0.416***	-0.195**	-0.268**	-0.361	-0.566**
	(0.091)	(0.102)	(0.070)	(0.076)	(0.129)	(0.081)
Social and open	0.0803	-0.00861	0.0544	-0.0611	0.111	0.0447
	(0.066)	(0.079)	(0.089)	(0.098)	(0.054)	(0.086)
Control over life	-0.474***	-0.310**	-0.543***	-0.410***	-0.392**	-0.209
	(0.059)	(0.085)	(0.063)	(0.089)	(0.084)	(0.116)
Persistent	-0.0663	-0.0968	-0.0283	-0.0678	-0.112	-0.126
	(0.050)	(0.132)	(0.064)	(0.139)	(0.039)	(0.142)
Rely on self	-0.128	-0.0963	-0.139	-0.0617	-0.116	-0.131
	(0.073)	(0.126)	(0.089)	(0.185)	(0.087)	(0.072)
			Peer self-assessment			
Productivity vis-à-vis peers from the production unit	0.0809	0.139	0.0911	0.225*	0.0685	0.0476
	(0.043)	(0.073)	(0.078)	(0.093)	(0.060)	(0.076)
Productivity vis-à-vis peers with the same skill	-0.291	-0.417	-0.269	-0.349	-0.317	-0.484
	(0.223)	(0.250)	(0.249)	(0.307)	(0.320)	(0.376)
			Other			
Interest in participation in future skill-development programs	0.337	0.736	0.261	0.603	0.424	0.873
	(0.463)	(0.437)	(0.379)	(0.333)	(0.612)	(0.536)
Stimulation programs for productivity are beneficial	0.0335	-0.0151	0.0718	-0.0122	-0.0114	-0.0181
	(0.093)	(0.233)	(0.129)	(0.270)	(0.081)	(0.273)

*Source: Authors' calculations. *, ** and *** refer to statistical significance at the 10%, 5% and 1% level of significance. Standard errors provided in parentheses. Standard errors robust to heteroskedasticity and potential correlations within production units. Time and individual fixed effects used.*

The intervention directly improved optimism while reducing anxiety and hopelessness, with particularly strong stress-relief benefits for women. Some of these positive effects extended beyond direct participants, as immediate colleagues—non-participants—also exhibited improved outlooks, suggesting that workplace interactions helped reinforce the program's key messages. However, other benefits, such as increased peacefulness, effort relief, and joy, were observed only when compared to immediate colleagues, indicating a lack of spillover effects—or possibly even negative effects due to social comparison or feelings of exclusion.

At the same time, participants became more aware of external constraints while gaining reassurance about their own productivity, suggesting that the intervention not only influenced emotional well-being but also shaped workers' perceptions of their capabilities. The distinction between the primary control and spillover control comparisons underscores that direct engagement with the program was essential for fostering deeper, introspective changes, whereas broader shifts in workplace attitudes—such as increased optimism—could diffuse through social interactions.

These findings highlight the dual nature of workplace interventions: while they can generate both direct and indirect benefits, the most profound psychological and behavioral transformations require active participation. The reduction in stress and anxiety, particularly for women, likely played a crucial role in sustaining post-program productivity gains by improving focus, motivation, and resilience at work. Enhanced optimism and reduced hopelessness may have contributed to greater persistence in tasks, while increased awareness of external constraints could have led workers to adopt more efficient strategies within their control. This has a likely strong role to play in explaining the productivity gains from EPeDeP we identified earlier. However, the potential unintended effects—such as reduced self-organization and the program's interaction with unpaid domestic responsibilities—suggest that while the intervention fostered well-being, it may have also shifted workplace dynamics in ways that temporarily dampened autonomous decision-making. Ensuring that such programs are structured to reinforce both psychological well-being and self-directed productivity could further enhance long-term efficiency gains.

7. CONCLUSIONS AND POLICY CONSIDERATIONS

The findings of this study provide robust evidence that on-the-job soft skills training can enhance worker productivity, with particularly pronounced effects among women. The EPeDeP intervention led to a 1.13% increase in productivity during the program and a 0.4% increase post-intervention, demonstrating that the benefits of soft skills training extend beyond the training period. Arguably, the post-treatment effect is smaller than the during-treatment one, but this may be well related to the short period elapsed after the program ended. While no statistically significant wage changes were observed, likely due to relatively fixed wage structure over a short period of time, the productivity gains highlight the value of investing in non-technical skill development.

The intervention also revealed heterogeneous impacts based on worker characteristics. Women, particularly those with secondary education, experienced greater efficiency gains, particularly after the intervention, underscoring the potential of targeted training to reduce gender disparities in workplace productivity. Age also played a significant role, with older workers benefiting more post-intervention. However, challenges emerged regarding work-life balance, particularly for women with children, as they experienced higher levels of tardiness both during and after the intervention. This suggests that training schedules and workplace policies should consider the time constraints imposed by household and caregiving responsibilities in a still-traditional and patriarchal society.

The findings reveal that EPeDeP had a greater impact on workers with fewer existing financial incentives. While the sickness-related bonus had limited effect, workers who received low or no performance bonuses saw higher productivity gains, especially women. Female workers without strong financial incentives experienced a post-program increase of 0.5 p.p., suggesting that the program addressed skill-related and structural barriers not covered by bonuses alone. These results highlight that well-designed interventions can complement financial incentives, driving productivity improvements among under-incentivized workers.

Another key finding is that while the intervention had a positive impact on psychological well-being, including increased optimism and reduced anxiety among women, it also made participants more aware of external constraints, potentially reshaping their perception of control over their work and personal lives. These are among the likely channels through which the program resulted in efficiency gains. The unintended decline in self-organization and responsibility suggests that workplace interventions must balance skill-building with reinforcing individual autonomy, which

may be well related with the finding on tardiness, especially when the female worker has children.

Based on the findings, the following recommendations are specifically tailored for the company Comfy Angel to enhance the effectiveness of future interventions and drive sustained productivity gains.

1. Invest in Soft Skills Training for All Workers. The company should continue investing in soft skills training, particularly for women and older workers, as the results show clear productivity gains, especially in reducing gender disparities. As an initial step, this training should now be extended to all workers, ensuring broader access to these benefits. However, it is important to tailor training schedules and policies to accommodate the work-life balance challenges of workers, particularly women with children. This will help minimize tardiness and maximize participation, ensuring that all workers can fully benefit from the program.

2. Re-evaluate and Tailor the Bonus Structure. The company should reconsider its bonus structure, given that workers with low or no financial incentives experienced the greatest productivity improvements. Targeted incentives, particularly for under-incentivized workers, may further boost productivity. Specifically, performance bonuses should be adjusted to reward incremental improvements in lower-performing workers, especially those who are not already benefiting from high levels of incentive. This adjustment would address skill gaps and motivate workers who might otherwise be overlooked, ultimately helping the company tap into the full potential of its workforce.

3. Reinforce Autonomy and Responsibility in Training Programs. While psychological benefits, such as increased optimism and reduced anxiety, were observed, the company should ensure that training programs also emphasize individual autonomy and responsibility. This will help prevent any unintended decline in self-organization, particularly for women. By reinforcing these key aspects, the company can prevent the negative side effects of the intervention and optimize both the immediate and long-term impacts on productivity and well-being.

The findings of this study raise important policy considerations for labor market interventions, workforce development programs, and gender-sensitive employment policies. Given the positive impact of soft skills training on productivity, policymakers should consider scaling such interventions across industries where teamwork, communication, and problem-solving are critical.

1. Incorporating Soft Skills into Vocational Training: Current vocational training programs often prioritize technical skills, overlooking the role of soft skills in enhancing productivity and workplace cohesion. Policymakers should integrate structured soft skills training into national workforce development strategies, particularly in manufacturing sectors with low productivity.

2. Gender-Sensitive Workforce Policies: The differential impact of the intervention on women highlights the need for policies that address gendered constraints in the workplace. Employers should explore more flexible work arrangements, such as on-site childcare support, adjusted training schedules, or compensated training hours within the workday, to ensure equal access to skill-building opportunities.

3. Employer Incentives for Training Investments: Many firms may be reluctant to invest in training due to concerns about worker turnover and uncertain returns on investment. Governments can consider tax incentives, co-financing models, or public-private partnerships to encourage businesses to integrate continuous learning programs into their operations.

4. Enhancing Workplace Productivity Beyond Training: While soft skills training demonstrated positive effects, its impact on absenteeism and tardiness, particularly among women, suggests that workplace policies should complement training interventions. Implementing family-friendly policies, mental health support, and leadership pathways for trained workers can enhance the long-term benefits of such programs.

5. Evidence-Based Policymaking and Scaling Up: The study underscores the importance of rigorous impact evaluations to assess training program effectiveness. Policymakers, employers' associations and single employers should support more experimental and quasi-experimental studies to refine intervention designs, ensuring they are scalable, cost-effective, and tailored to industry-specific needs.

In conclusion, this study provides compelling evidence that soft skills training can improve productivity, particularly among women. However, to maximize the benefits, policymakers and employers must consider broader structural, gendered, and workplace dynamics when designing training interventions. Future research should focus on long-term effects, cost-effectiveness, and optimal program designs that balance skill-building with worker autonomy and well-being.

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