



Private Enterprise Development in Low-Income Countries

Learning Dynamics and Managerial Quality

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We study 5 distinct factors of managerial quality that are likely to impact learning by doing within the firm: vocation-specific experience, managerial autonomy, cognitive skills, personality, and demographic relatability to workers. We find that experience predictably impacts all aspects of learning and retention, but so do managerial autonomy and cognitive skills. Personality traits impact learning but not forgetting; while relatability to workers surprisingly shows no impact on productivity. We also find that firms can increase productivity at lower cost by adopting better screening mechanisms in the hiring of new supervisors and training existing supervisors in deficient qualities.

Background

As developing economies move away from agriculture, and towards manufacturing, it becomes crucial to understand factors affecting the potential for success and growth among manufacturing firms. The global apparel sector is one of the largest export sectors in the world, crucial for job creation, specially for women, in developing countries. The textiles and apparel sector in India contributed 15% to the country's export earnings and is the second largest employment provider in the country, after agriculture. In 2015-16, it directly and indirectly employed 105 million people.

In this context, it becomes extremely important to ensure that firms in this sector are productive, and are undertaking steps to increase productivity. Learning by doing has long been considered an important determinant of firm productivity (Arrow, 1962; Lucas, 1988). Additionally, recent studies have documented the importance of managerial practices in worker and firm productivity (Bloom et al., 2010; Bloom and Van Reenen, 2007). In this study, we look at the relationship between certain managerial attributes of supervisors (floor-level managers that oversee the work of entry operators and tailors) and line productivity, at six garment factories in Bengaluru, India.

We find that, beyond the traditional measures of experience and skill, two factors of managerial quality (managerial autonomy and personality traits) contribute to higher productivity for the firm, but are undervalued in current wage contracts. These results emphasize the scope for firms to improve productivity cost effectively by better identifying these factors during the hiring process and/or supplementing deficiencies among existing managers through training.

Data collection

We match two years of daily, line-level production data from 96 production lines across six garment factories in India (2013-15) to rich data on managerial practices from a survey conducted for all the line supervisors in these factories. All line supervisors (166 total, 1-3 per line) are surveyed regarding demographics, work history, personality, cognition, managerial style and specific practices. The production data includes information on which style/product each line is producing on each day (over 1000 unique styles are observed) from which we can calculate the current and past experience producing a given style for each line.

Results

- **The learning by doing process in the factory**

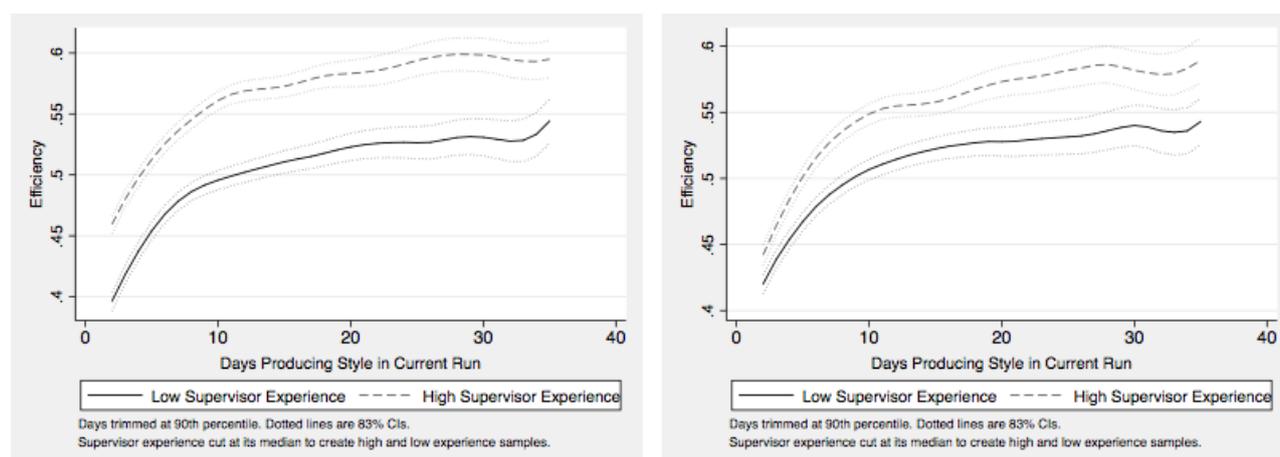
We carry out our analysis using both a quantity based measure of the production lines' experience producing the current style as well as a time-based measure. We find that lines start production of a style at 40% efficiency on average, and can reach a maximum of 60% over the product run. Roughly half of this learned productivity accrues within the first 10 production days or 3-4000 units produced of a given style. Moreover, productivity gains accrued during the first run of a style are retained in subsequent runs. That is, lines start at higher productivity if they have produced a style before, leaving less scope for additional learning. However, roughly half of the value of retained prior learning depreciates after 2 production weeks of elapsed time between the two runs of the same style.

- **The five dimensions of managerial quality**

We go on to identify the following 5 distinct factors of managerial quality that impact these learning dynamics:

- **Experience:** We find that vocation-specific experience of the line supervisor impacts all aspects of the learning curve (i.e., initial productivity, rate of learning, degree of retention, and rate of forgetting). The two primary measures that inform this factor are: 1) experience as a line supervisor, and 2) experience supervising the current line. Both measures reveal that lines supervised by more experienced supervisors are more efficient both at the start of production and during the entire production process (including subsequent runs of the style). A one standard deviation increase in the experience factor raises productivity on an average day by 77%, but corresponds to only an 18% increase in wages.

Figure 1: Learning curves impacted by line supervisor's experience



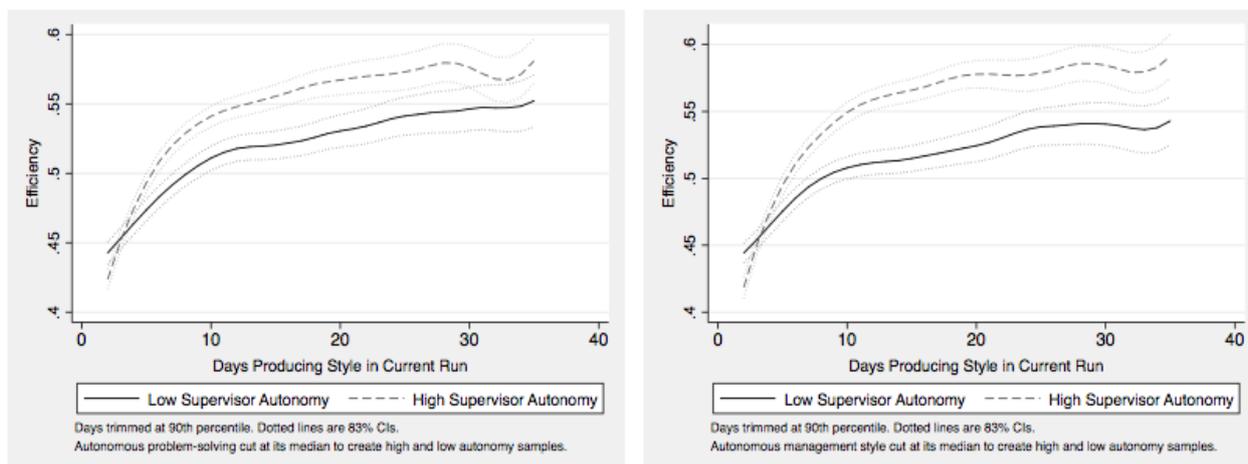
Notes: The first graph depicts learning curves by above and below median “years as a line supervisor/years in garment industry”, the second above and below median “years supervising the current line/years in garment industry”.

- **Autonomy:** Production lines with managers exhibiting greater autonomy learn at significantly faster rates (and retain more / forget less), but do not start at higher productivity levels. Two measures inform this factor. The first index measures the degree to which managers to identify and solve problems without relying heavily on upper management or passing the responsibility to the worker. The second measures the manager's style (e.g., “act without consulting others”). A

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one standard deviation increase in the autonomy factor raises productivity on an average day by 26%, but only contributes 5% to wages.

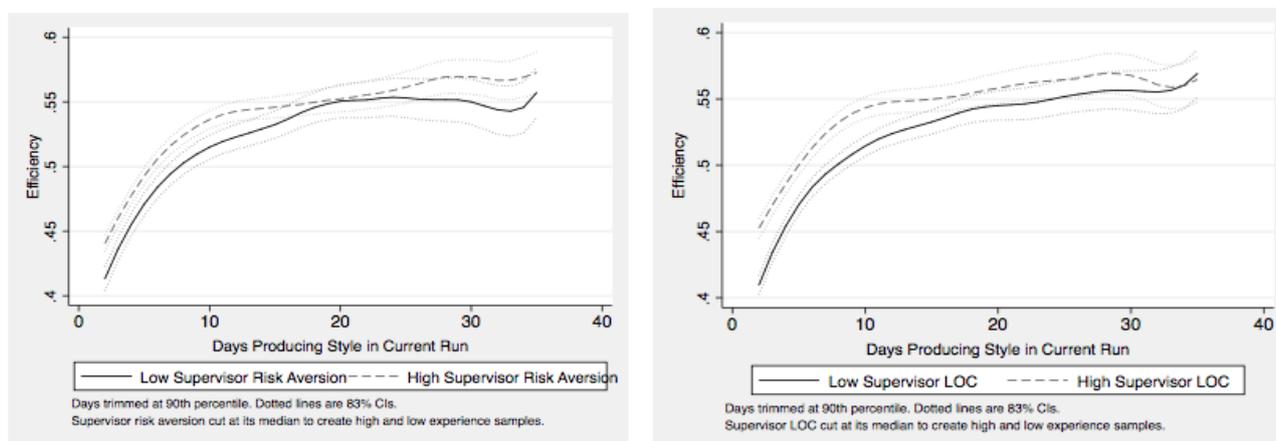
Figure 2: Learning curves impacted by line supervisor’s autonomy



Notes: The first graph depicts learning curves by above and below median “autonomous problem solving,” while the second depicts curves by above and below median “autonomous management style”.

- Personality traits:** The personality factor affects initial productivity and rate of learning, but not forgetting. The primary measures informing this factor are risk aversion and locus of control, both of which show higher initial levels but common slopes in the below graphs. A one standard deviation increase in the personality factor raises productivity on an average day by 16.5%, but increases wages by only 3%.

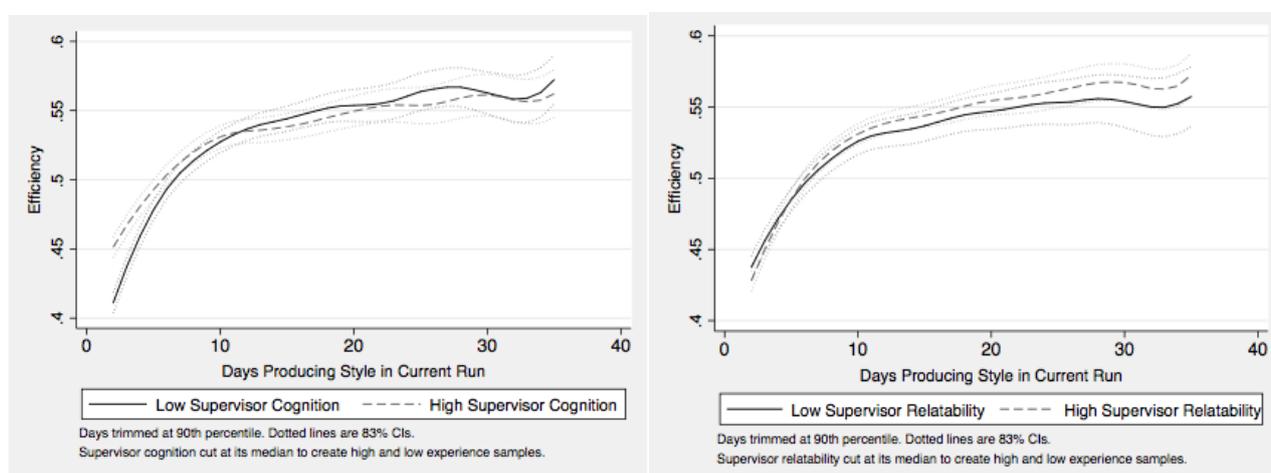
Figure 3: Learning curves impacted by line supervisor’s personality traits



Notes: The first graph depicts learning curves by above and below median “risk aversion” while the second depicts curves by “locus of control”

- Cognitive skills:** Digit span recall and percentage of correct answers in a math test are used to inform the cognitive skills factor. Though not apparent in the raw data figures depicted below, the cognitive factor impacts all aspects of learning and forgetting after controlling for all other factors of managerial quality. A one standard deviation increase in the cognitive factor raises productivity on an average day by 17.5% and wages by 6%.

Figure 4: Learning curves impacted by line supervisor's cognitive skills



Notes: The first graph depicts learning curves by above and below median “digit span recall” while the second depicts “demographic similarity”.

- **Reliability to workers:** The primary measure informing the reliability factor is an index measuring similarities between the managers and the workers of the line regarding their caste/religion, age, and birthplace. In contrast to some recent studies (e.g., Hjort 2014), we find no evidence of a significant impact of reliability to workers on productivity after accounting for the other factors of managerial quality. Wages also do not significantly respond to reliability.

As noted above, we find that these productive factors are not adequately rewarded in wage contracts. More easily observed factors like experience and cognitive skills are more proportionately reflected in wages, though still undervalued; while less easily observed productive factors like managerial autonomy and personality traits are largely ignored altogether in compensation schedules.

Results

Our results indicate that firms can develop more effective screening mechanisms and more efficient wage schedules to hire and appropriately reward supervisors with these productive yet overlooked dimensions of managerial quality. In addition to enabling faster learning, higher quality supervisors are also better able to handle shocks to worker productivity like pollution (Adhvaryu et al. 2016). However, few supervisors currently possess the skills emphasized in our study. In order to overcome this deficiency in the managerial quality of existing supervisors, the next logical step is for firms to train deficient managers in hard to signal or productive skills (Acemoglu & Pischke 1998).



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Moving Forward...

The Supervisor Transformation into Change Holders (STITCH) intervention, which is currently in the testing phase at garment factories in Bengaluru, trains supervisors in precisely these productive yet deficient skills. After identifying aspects of managerial quality that are the most important determinants of productivity through this study, we helped to develop modules to address factors that are most deficient across supervisors. These modules cover topics such as self-esteem, gender sensitivity, problem solving, planning work, and preventing harassment at the workplace. We also surveyed the upper level management to investigate whether they are able to identify which supervisors are most deficient and amenable to training before the implementation of the program. Through this randomized controlled trial, we aim to rigorously evaluate how supervisor training causally impacts the satisfaction, retention, attendance, and productivity of workers, as well as how it produces return on investment to the firm.