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# Workers, Managers, and Productivity: How Investments in Workers can Fuel India's Productivity Growth[§]

**ABSTRACT** We describe a set of stylized facts on India's manufacturing productivity, showing that aggregate productivity growth in India has slowed considerably in the past decade and has been, on average, negative in the past several years. There is also substantial variation in productivity across India, even when controlling for State and industry effects. We focus on one potential determinant of this variation, namely, firms' investments in their workers. A robust positive association exists between such investments and firm output per worker, even within State and industry. This relationship suggests but does not dispositively demonstrate, that investing more in workers causes productivity improvements. We, therefore, review the literature on four categories of investments in workers that show a high potential to raise productivity: soft skills, voice, environmental conditions, and managerial quality. In each case, we focus on studies that demonstrate the relationship between investments and productivity causally, most often via prospective Randomized Controlled Trials (RCTs). We end with a description of why firms may be systematically under-investing in workers and why more evidence is needed to understand firm behavior.

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***JEL Classification:*** *J24, L22, M53, O14*

## 1. Introduction

India's manufacturing sector is widely held as a key to the ongoing structural transformation of its economy, the pathway for millions of low-income Indians to grow their incomes out of poverty, and a linchpin of India's overall economic competitiveness on the global stage (Aggarwal and Kumar 2015). Indian manufacturing is particularly important given the accelerating global demand to shift supply chains away from China (Ghosh and Mukherji 2020). The United States, the European Union countries, and other large economies view India as a primary destination towards which key aspects of global production could move. However, absorbing this potential demand would require a massive expansion of manufacturing capacity within India (Rajan 2015; Iyer 2018). Raising manufacturing's share of GDP from 16 percent to 25 percent in the coming decade is a key stated goal of the Government of India (Iyer 2018; Barhat 2023). At the heart of the government's focus on manufacturing as a source of growth stands the "Make in India" program–to reduce dependence on China and other major sources of imports –which also necessitates substantial manufacturing growth (Anand et al. 2015). In particular, the program aims to raise manufacturing growth by 12-14 percent per year, create over 100 million jobs in the manufacturing sectors, allow poor and rural populations to acquire the skill sets necessary to benefit from this growth, increase domestic value added, and improve India's global competitiveness in manufacturing (Iyer 2018). These goals consequently imply that manufacturing productivity is of critical importance as India wishes to position itself as a major player in the global "friendshoring" trend, as well as for India's desire to be more self-reliant in the production of consumer goods (Kumar 2022; TNN 2023).

We begin by examining trends in India's manufacturing productivity to establish some basic stylized facts related to aggregate productivity growth and the dispersion in productivity across States and industries. Our takeaway from these statistics is that the growth in manufacturing productivity, as measured by sales per worker, has slowed considerably in the past decade, particularly in the several years leading up to the start of the COVID-19 pandemic in 2020. There is also considerable heterogeneity in productivity across Indian States: States in Western and Central India tend to have the highest average productivity, while States in the East and South have the lowest. These cross-State differences persist when controlling for State industrial composition. More generally, in alignment with the extensive economics literature on productivity dispersion,

the difference in productivity across the most and least productive firms is vast in India, even after controlling for State and industry effects.

Having established these trends, we focus on firms' investments in their workers as one potential determinant of firm productivity. This determinant has received less academic and policy attention than others—e.g., in terms of capital misallocation and regulatory distortions, among other things. While studies in economics have long recognized the importance of on-the-job human capital accumulation (e.g., Mincer 1962; Becker 1964), advances in the estimation of causal treatment effects via RCTS or plausibly exogenous variation in investment have made possible the investigation of the impacts of such investments in the real world, particularly in low-income country contexts, where worker productivity is on average low (Bloom and Reenen 2010). To begin, we study this phenomenon across India by examining the relationship between productivity and so-called emoluments, which include wages and the value of all benefits provided to employees. We find that the two variables are very closely positively associated, indicating that the elasticity of productivity with respect to emoluments is nearly one-for-one in percentage terms. This magnitude remains unchanged when controlling for State-by-industry fixed effects and additional controls.

Although quite robust, the positive association between worker investment and productivity is not necessarily causal: unobserved choices of the firm may be correlated with both wage and benefit provision to employees, on the one hand, and productivity on the other. We then focus on various categories of investment in workers and the causal evidence for their impacts on productivity. We look in particular at the potential impacts of investments in enhancing/ameliorating soft skills, voice, environmental conditions, managerial quality, and health for workers. Within each category, we review studies that establish causal impacts via prospective RCTs or via the use of credibly exogenous variation. We highlight the productivity impacts of such investments when these estimates are available but also study other worker outcomes of relevance to the overall profitability of firms, e.g., turnover, absenteeism, and task complexity, among others. We then discuss various reasons for firms' under-investment in their workers, the barriers that firms face, and market-related reasons for non-investment. Finally, we highlight the need for more research to understand firm behavior.

## 2. Some Stylized Facts on Manufacturing Productivity in India

### *2.1. Fact 1: Productivity Growth in Indian Manufacturing is Slowing*

Throughout this section, we use data from the Annual Survey of Industries (ASI), comprising a representative sample of Indian manufacturing firms (and a census of large firms). We define productivity as revenue (sales) per worker.

Recent research shows that total factor productivity growth in manufacturing has been slowing down in India, especially in the last decade (see Erumban et al. 2019; Krishna et al. 2020; Rawat and Sharma 2021, for example). These patterns are reflected in aggregate output per worker. Figure 1 shows the trend in the series of aggregate (pan-India) annual real productivity growth in manufacturing from 1995 to 2020. The figure reveals a general downward trend in productivity growth since the 1990s, decelerating in the mid-2010s and the years leading up to the COVID-19 pandemic. The growth rate of productivity was trending down, fluctuating between 5 and 10 percent in the 1990s and 2000s. Productivity growth began to stagnate more after 2012, and this negative trend accelerated into the several years preceding the pandemic, even leading to negative growth rates for certain years.

**FIGURE 1. Growth Rate of Aggregate Real Sales per Worker**


Source: Authors' calculations using various Annual Survey of Industries (ASI) rounds.
Note: For every year, we compute the ratio of aggregate sales in 100,000 INR of 2020 to the aggregate number of workers across India. We compute the growth rate from year to year and plot the smoothed series. We use a locally weighted regression (lowess) smoother with a corresponding bandwidth of 0.2, meaning that each point represents a weighted average of the year of observation, the previous and subsequent two years.

### *2.2. Fact 2: Indian Manufacturing Productivity is Several Times Lower Than That of the United States*

Consistent with an extensive literature documenting differences in productivity across countries, the level of manufacturing productivity in India ($92,800) in

2020 was close to a seventh of manufacturing productivity in the United States ($652,400, taken from the U.S. Annual Survey of Manufacturers (2021)). This is true even after adjustment for purchasing power (after accounting for PPP, Indian productivity rises to $314,200 per worker, still only half of the figure in the U.S.).[1]

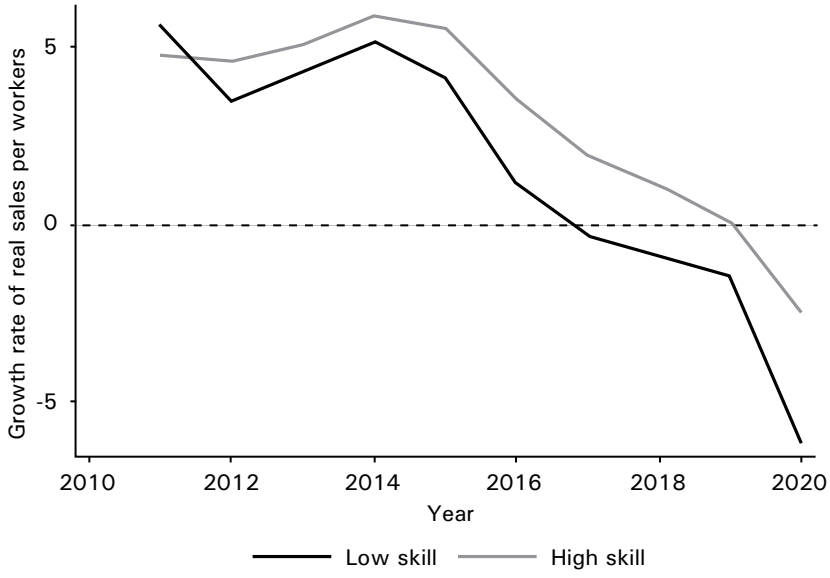
### *2.3. Fact 3: Productivity Differs by High-skill and Low-skill Industries*

We show that the productivity growth rate in low-skill manufacturing is decelerating faster than in high-skill manufacturing industries. Figure 3 plots the smoothed growth rate series for industries above and below the median in terms of their intensity in abstract tasks, which are associated with high-skill work. We follow an approach Gauthier (2023) developed to establish which industries are intensive in abstract tasks. Autor et al. (2003) and Acemoglu and Autor (2011) classify U.S. occupations based on task intensity. Abstract tasks are defined by Acemoglu and Autor (2011) as "activities that require problem-solving, intuition, persuasion, and creativity. These tasks are characteristic of professional, managerial, technical, and creative occupations, such as law, medicine, science, engineering, design, and management, among many others." U.S. and Indian occupations map into the International Standard Classification of Occupations (ISCO) allowing Gauthier (2023) to import the task-composition classification at the occupation level in India. To construct a measure of the abstract-task intensity at the industry level, Gauthier (2023) then uses the National Sample Survey, which contains the occupation and industry the individual works in. This allows the author to measure how intensive the different Indian industries are in terms of abstract tasks. In Figure 3, we use this procedure and define high-skill industries as those above the median in terms of abstract-task intensity in 2010.

The growth rate in productivity for high-skill industries is positive and trending up until 2015. It remains positive but starts to trend down until 2020 when it becomes negative. Instead, the growth rate is trending down for the whole period in low-skill industries and becomes negative as early as 2017. This provides suggestive evidence that upgrading production processes by moving away from highly manual production processes and skilling up workers may, at least, lower the decline in productivity growth.

1. We calculate the sales per worker for India using ASI, 2020 summary tables using total output and workers employed. The sales per worker for the US is calculated using Annual Survey of Manufacturers, 2020 (U.S. Census Bureau 2020). We use the average value of the rupee in 2020 for the nominal exchange rate. The nominal exchange rate and PPP values come from the OCED data (OECD 2023).

**FIGURE 2. Growth Rates at the Three-digit Industry Level by Skill Requirements**




Source: Authors' calculations using various Annual Survey of Industries (ASI) rounds.

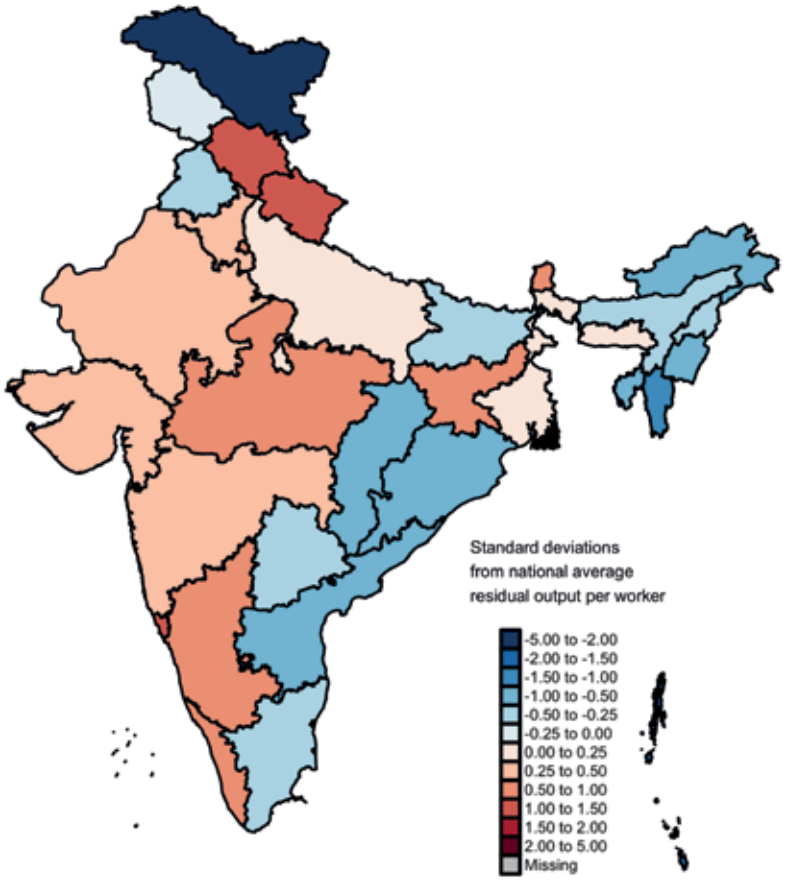
Note: For every year, we compute the ratio of aggregate sales in 100,000 INR of 2020 to the aggregate number of workers by three-digit industries using the National Industrial Classification (NIC). Because of changes in the NIC, we limit our analysis to years where the ASI data uses the latest NIC, corresponding to 2010 onwards. We compute the growth rate from year to year for each industry. Then, we compute the yearly average growth rate and plot the lowess-smoothed series for low-skill and high-skill industries, respectively. We follow an approach Gauthier (2023) developed to establish which industries are intensive in abstract tasks. Autor et al. (2003) and Acemoglu and Autor (2011) classify U.S. occupations based on task intensity. Abstract tasks are defined by Acemoglu and Autor (2011) as "activities that require problem-solving, intuition, persuasion, and creativity. These tasks are characteristic of professional, managerial, technical, and creative occupations, such as law, medicine, science, engineering, design, and management, among many others." U.S. and Indian occupations map into the International Standard Classification of Occupations (ISCO) allowing Gauthier (2023) to import the task-composition classification at the occupation-level in India. To construct a measure of the abstract-task intensity at the Industry level, Gauthier (2023) then uses the National Sample Survey, which contains the occupation and industry individuals work in. This allows for the author to measure how intensive the different Indian industries are in terms of abstract tasks. We use this procedure and define high-skill industries as those above the median in terms of abstract-task intensity in 2010.

### *2.4. Fact 4: There is a Large Dispersion in Manufacturing Productivity across Indian States and Industries*

Using factory-level data from 2010 to 2020, we first net out three-digit industry and year fixed effects from real sales per worker and compute the average residual sales per worker at the state level.[2] In Figure 3, we plot the (standardized) deviation in residual sales per worker for each State and Union

2. We add the mean value of real sales per worker to the residual to preserve scale.

**FIGURE 3. Deviation of Sales per Worker from the National Average at the Three-digit Industry Level by Skill Requirements**




Source: Authors' calculations using various Annual Survey of Industries (ASI) rounds.
Note: Using factory-level data from 2010 to 2020, we regress sales in INR of 2020 per worker at the factory level on 3-digit industry, year fixed effects. The residuals of this regression represent real sales per worker net of industry composition differences and yearly shocks. Note that we add the mean value of real sales per worker to the residual to preserve scale. We then compute the average residual sales per worker at the State level and plot the standard deviation in residual sales per worker for each State and Union Territory relative to the national average. The output per worker is the largest in ascending order in Delhi, Sikkim, Goa, Himachal Pradesh, and Uttarakhand. It is the lowest in Chhattisgarh, Arunachal Pradesh, Mizoram, Andaman & Nicobar Islands, and Ladakh, with the latter being the least productive.

Territory relative to the national average. There is substantial variation in the average productivity across the country. For example, the sales per worker in INR of 2020 of the State at the 10$^{th}$ percentile of this productivity distribution is 1.8 million INR ($24,300), as compared to the 90$^{th}$ percentile, which is 9.1 million INR ($122,700). This difference remains substantial even after accounting for State-level industry composition and yearly shocks. The residual

difference is still large: 3.8 million INR ($51,500) at the 10th percentile versus 8.8 million INR ($114,500) at the 90th percentile. The adjusted difference is nearly 90 percent of the average productivity level across India. Western and Central Indian States tend to have higher industry-adjusted productivity in manufacturing, while the case is opposite for the Southern and Eastern States. This is in contrast to the GDP per capita ranking of States, in which the Southern States tend to have higher incomes than their Western and Central counterparts.

**TABLE 1. Conditional Association between Productivity and Non-wage Benefits**

| | *Log(real sales)* | | |
|---|---|---|---|
| | *(1)* | *(2)* | *(3)* |
| Log(real emoluments) | 0.333*** | 0.340*** | 0.321*** |
| | (0.0196) | (0.00807) | (0.00721) |
| Log(number of workers) | -1.081*** | -1.052*** | -0.996*** |
| | (0.0604) | (0.0325) | (0.0234) |
| Log(real wages) | 0.661*** | 0.640*** | 0.615*** |
| | (0.0463) | (0.0262) | (0.0192) |
| Observations | 344583 | 344583 | 344583 |
| Year FE | N | Y | Y |
| State FE | N | Y | Y |
| NIC3 FE | N | Y | Y |
| StateXyear FE | N | N | Y |
| NIC3Xyear FE | N | N | Y |
| StateXNIC3 FE | N | N | Y |
| StateXNIC3Xyear FE | N | N | Y |

Source: Authors' calculations using various Annual Survey of Industries (ASI) rounds.

Note: We define non-wage benefits as the sum of PF (contribution to provident and other funds) and welfare (workers and staff welfare expenses). Using factory-level data from 2010 to 2020, we regress log sales in INR of 2020 on log real non-wage benefits, log real wages, and log number of workers at the factory level. In Column (2), we include year, State, and three-digit industry fixed effects. In Column (3), we add State-by-industry time trends. The standard errors are clustered at the three-digit by State level. ***, **, * indicates statistical significance at the 1 percent, 5 percent, and 10 percent levels, respectively.

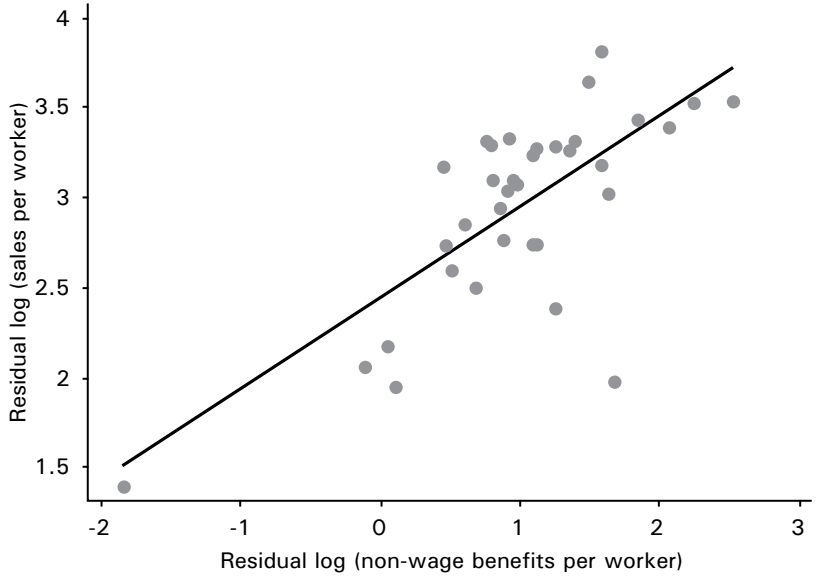
### *2.5. Fact 5: Productivity is Strongly Correlated with firms' Investments in Their Workers*

We next examine firms' investments in workers and how these relate to productivity. As a proxy for investment, we use non-wage benefits, data on which are collected for every firm in the ASI. We define non-wage benefits as total payments made by the firm to its employees other than wages and bonuses.[3] It includes goods or services provided to employees free of cost or at

3. Note that the results also hold if we include wages and bonuses as part of emoluments.

a subsidized rate (e.g., medical facilities, recreation, compensations to attend religious festivals). Using factory-level data from 2010 to 2020, we first net out three-digit industry and year fixed effects from the log of real sales per worker as from the log of real non-wage benefits per worker and compute the average residuals at the state level.[4] In Figure 4, we plot the residuals against one another. As is evident, there is a tight positive association between output and emolument per worker across States. The figure suggests that a 1 percent increase in non-wage benefits per worker is associated with 0.5 percent higher output per worker.

**FIGURE 4. Association between Residual Log Productivity and Residual Log Non-Wage Benefits**




Source: Authors' calculations using various Annual Survey of Industries (ASI) rounds.
Note: We define non-wage benefits as the sum of PF (contribution to provident and other funds) and welfare (workers and staff welfare expenses). Using factory-level data from 2010 to 2020, we regress log sales and log non-wage benefits in INR of 2020 per worker at the factory level on three-digit industry, year fixed effects. The residuals of these regressions represent log real sales and log real non-wage benefits per worker net of industry composition differences and yearly shocks. Note that we add the mean value of each variable to the corresponding residual to preserve scale. We then compute the average residual log real sales and residual log real non-wage benefits per worker at the State level and plot one variable against the other.

In Table 1, we regress log productivity on log non-wage benefits controlling for firm size and wages, finding an elasticity close to 0.3 in percentage terms. After accounting for State and industry differentials, this relationship remains

4. We add the mean value of the variables to the residuals in order to preserve scale.

unchanged, allowing for State-by-industry time trend differentials. This last, most stringent specification reflects the idea that the positive association between investments in workers and productivity persists even when comparing firms operating in the same industry and located in the same Indian states. The coefficient changes very little with the addition of progressively more stringent fixed effects and controls.

## 3. Causal Evidence on the Impacts of Investments in Workers

The significant association between investment in employees and productivity suggests that part of this relationship may be causal. Unobserved correlates of worker investments and productivity might generate bias in estimating the impact of these investments on worker productivity. In this section, we explore different types of employee investments and evaluate their causal implications on productivity by examining studies that use RCTs or rely on convincingly exogenous variation in the level of investments.

### *3.1. Category 1: Soft Skills*

In the manufacturing sector, most emphasis on worker training is focused on "technical skills" due to, among other reasons, the repeated nature of tasks expected from these workers and the labor-intensive nature of the job (Bassi and Nansamba 2022; Borghans et al. 2008; Deming 2017; Groh et al. 2012; Guerra et al. 2014; Heckman and Kautz 2012; Heckman et al. 2006; Montalvao et al. 2017). While these are crucial skills, particularly for frontline tasks, a growing pool of evidence has showcased the benefits of developing non-technical or "soft" skills. Many of these studies, primarily focused on OECD countries, provide correlational evidence of how soft skills, such as time management, effective communication, problem-solving, and teamwork, contribute substantially to on-the-job quality and earnings. Teaching soft skills through vocational and entrepreneurship training might also help job-seekers become better candidates and transition into long-term employment.

Recent evidence from India shows that the benefits of investing in soft skills for large-scale manufacturing firms can improve well-being and productivity outcomes for female garment workers, resulting in a high return on investment. Working with workers from an Indian garment factory in Bangalore, Adhvaryu et al. (2023c) evaluated a soft skills training program and its impacts on employee and employer outcomes in a trial covering approximately 2,700 workers. The program tested was the Personal Advancement and Career Enhancement (P.A.C.E.) training program (developed by GAP, Inc.) for female garment workers. The program emphasized communication skills, time management, decision-making skills, financial literacy, and problem-solving

skills via weekly workplace group sessions. Using firm administrative data, the researchers measured workplace outcomes such as retention, productivity, and salary. Survey data measured changes in baseline levels of knowledge, behaviors, and personality traits of workers. The study found that on-the-job soft skills training among Indian female garment workers increased productivity by 13.5 percent without increasing turnover. It also found significant gains for the firm to invest in such a program; 20 months after the end of the training program, the net rate of returns to the firm climbed to over 250 percent. These results show that personality changes through soft-skills training can lead to significant productivity gains for the firm, contributing to an overall high return on investment in the long run.

Soft skills can also be a helpful tool for small-medium enterprises (SMEs) and micro-entrepreneurs in the manufacturing industry, who otherwise do not have the resources to make large worker investments to boost productivity. Campos et al. (2017) evaluated how improvements in the soft skills of micro-entrepreneurs impacted business sales effectiveness and profitability in Togo. The study provided two different types of training interventions: a standard business training on best practices (examples of modules taught included record keeping, stock control, and marketing skills) and a novel psychology-based personal initiative training program that focused on changing mindsets around self-starting behavior, innovation, identifying and exploiting new opportunities, goal-setting, planning, feedback cycles, and overcoming obstacles. Results from this study show that as compared to business training, the psychology-based personal initiative training program that teaches a proactive mindset and focuses on entrepreneurial behaviors increased firm profits by 30 percent over two years. The authors observed heterogeneity in treatment effects by gender. Women who received personal initiative training saw their profits increase by 40 percent, as compared to a 5 percent increase for those who had traditional business training. The training program ended up being affordable, with the break-even point being less than one year.

Manufacturing firms can choose to bundle soft skills training with technical or on-the-job skills to provide more opportunities for workers to boost their earnings and for firms to increase their productivity by hiring and retaining 'well-rounded' workers. Chioda et al. (2021) studied the effects of a three-week skills development program for high school students in Uganda. The program featured two treatments: the hard-skills MBA featured a mix of approximately 75 percent hard and 25 percent soft skills; the soft skills curriculum had the reverse mix. After a three-year follow-up, the results showed that the training effectively improved both hard and soft skills. However, only soft skills were linked to self-efficacy, persuasion, and negotiation improvements. The skill upgrade resulted in substantially higher earnings for participants, 32.1 percent and 29.8 percent increases for those who attended hard and soft training, most of which was generated through self-employment. Furthermore, the youth

in both groups were more likely to start enterprises and be more successful in ensuring their business's survival. The program led to significantly larger profits (24.2 percent and 27.2 percent for hard skills and soft skills treatment arms) and more significant business capital investments (38.4 percent and 32.6 percent for hard skills and soft skills treatment arms).

In sum, there is growing consensus that investing in developing soft skills, such as time management, communication, and problem-solving, can yield significant benefits for both workers and employers. Studies reveal that soft skills training can enhance productivity, earnings, and job quality, especially in the manufacturing sector, where soft skills training has significantly contributed to productivity. Research also reveals gender differences in the impacts of soft skills on workers/entrepreneurs, with women benefiting from such training more than men. Finally, integrating soft skills training with technical skills training has proven to be highly effective in equipping workers for success.

### *3.2. Category 2: Voice*

Relationships between employers and workers are vital for worker well-being and productivity. Employment may offer workers a sense of safety and comfort, and a strained relationship between employer and worker could negatively affect productivity and worker outcomes (job satisfaction, utility), possibly resulting in increased worker turnover. Hirschman (1970) famously championed the idea of "voice" in the employment relationship; workers have a choice when facing a challenge or grievance that threatens the relationship between employers and employees. They can either voice their discontent and precipitate improvements in this relationship or exit the employment relationship by leaving the firm. Increasing workers' ability to use their voice could thus improve the relationship between workers and their employers, thereby increasing productivity via reductions in turnover, workplace effort, and improved information flow and coordination (Malcomson 1983; Freeman and Lazear 1995).

After a disappointingly small statutory minimum wage increase in 2016, Adhvaryu et al. (2022b) conducted an RCT within a garment firm to understand the importance of furthering workers' voices, especially during times of general discontent within a workplace. Workers were asked at random to fill out a feedback survey in which they were asked about their feelings regarding their supervisors, overall worker satisfaction, satisfaction with the firm, their wages, and their jobs. This study found that enabling voice reduced turnover and absenteeism after the hike, particularly for the most disappointed worker. This effect was most substantial for workers who were most disappointed with the wage increment. At the average deviation from wage hike expectations (about 17 USD), treated workers were 16 percent less likely to quit than control workers; however, the treatment did not affect those whose expectations were exactly met. This study shows the benefits of enabling worker voice, especially during

and after significant workplace policy changes (particularly corresponding to the wage).

While engaging with workers and enabling worker voice during periods of crisis or uncertainty within a firm would be helpful, encouragement of this voice should move beyond situational-specific instances into a longer-term goal for firms to engage with workers through different accessible mechanisms, such as technology platforms designed to facilitate anonymized worker feedback. Adhvaryu et al. (2021) evaluate the impact of increasing worker voice through a two-way, SMS-based anonymous communication tool in two garment factories in India through an RCT. In the intervention, workers were able to send their grievances and suggestions about the workplace to their factory Human Resources (HR) department via SMS. The system masked the sender's phone numbers, ensuring anonymity, and this was communicated to the worker. While only 5 percent of the treated workers used this tool, the study found that the device reduced absenteeism by 5 percent and attrition by 10 percent among the treated workers as compared to the control group workers. To further sustain the impacts of worker voice improvements, especially when firms face increased worker hesitancy or low-take up of feedback mechanisms, research shows that it may be beneficial for firms to incentivize staff to address the concerns of their workers fairly and accurately. Adhvaryu et al. (2023a) tested a voice- and SMS-based anonymous two-way communication tool in 43 garment factories in India with randomization at the factory level. One group of randomly chosen factories received the communication tool alone, through which they could report their grievances to factory HR, and another received the tool, plus an incentive program for HR to resolve incoming cases promptly and accurately. The authors found that the tool plus incentives reduced worker absenteeism and increased factory productivity by 7.2 percent, while the tool alone had zero impact.

An alternative to building tools to further worker voice is adapting existing feedback mechanisms and making them more accessible to the workforce. Large manufacturing firms can adopt traditional evaluation procedures, such as 360-degree feedback, to boost workers' voices. Cai and Wang (2022) conducted a study among auto workers in China in which workers were allowed to evaluate their managers on managerial quality and well-being-related metrics. They found that by letting workers participate in the evaluation process, they essentially turn a top-down approach into a "360" evaluation that includes subordinates' experiences. They found that providing feedback reduced worker turnover by 50 percent and increased team-level productivity by 2.3 percent. These gains can be explained by changes in the behavior of managers and improved relationships between managers and workers. Although the evaluation system did not affect individual performance, team-level key performance indicators did increase significantly. This result is driven by the fact that treated teams have less worker turnover than control teams, and high turnover reduces

productivity because new workers typically perform poorly at the beginning of their term and tend to require substantial training to be brought up to steady-state levels of productivity.

In developing countries, the structural mechanisms to enforce labor regulations are weak for many reasons, including a lack of resources (Dal Bó and Finan 2016). In the case of the manufacturing sector, many multinational corporations (MNCs) enforce global standards of labor rights for their suppliers. Boudreau (2020) conducted an RCT in Bangladesh to assess the effects of MNC enforcement on establishments' compliance with Bangladesh's Safety Committees (SC) law. The study tested a six-month SC intervention to bring establishments into meaningful compliance with the law, which entailed monitoring SC activities and limited capacity building for SC members. The results showed that the stronger committees had a small but positive impact on safety, with large impacts on factories with better managerial practices. These improvements did not come at the cost of productivity, wage reduction, or employment. Earning worker trust through transparent investments in their well-being and effective and communicative management would lead to a stronger worker voice and foster a positive working environment.

The relationship between employers and employees is pivotal for productivity and job satisfaction. Research indicates that giving workers a voice can enhance productivity by reducing employee turnover and improving teamwork. Cai and Wang (2022) showed that workers evaluating their managers experienced reduced turnover, which led to increased team-level performance. In India, research indicated that enhancing worker voice, especially during times of discontent, substantially reduced the likelihood of employees quitting. Additional studies involving two-way anonymous communication tools showed reductions in absenteeism and significant productivity increases when the tools were coupled with incentives for HR to address issues promptly and efficiently.

### *3.3. Category 3: Environmental Conditions*

Workers' physical environment likely has a significant influence on well-being and productivity. The growing rates of extreme heat and pollution, particularly in urban settings in low-income countries, which are accelerating due to climate change, potentially threaten worker health, well-being, and consequently, firm productivity.

Temperatures are rising drastically in India; according to the meteorological department, in 2022, India experienced the hottest March since 1901. Since April 2022, 90 percent of the country has been at increased risk from hunger, loss of income, or premature death during record-breaking heat waves, which are becoming more common due to climate change (Debnath et al., 2023). These rising temperatures are, therefore, likely to cause adverse effects on the productivity of workers, especially in the manufacturing sector, where workers work long shifts in cramped working spaces.

Somanathan et al. (2021) studied the effects of rising temperatures on worker productivity in the States of Delhi and Gujarat, also focusing on how these effects vary between manual laborers and laborers in automated manufacturing settings. The researchers found that for a one-degree Celsius increase in temperature, productivity subsequently saw a two-percent reduction. Within these industries, when firms invest in cooling technologies, the authors show that the magnitude of the effect of temperature on productivity declines; this shows that investments in solutions to mitigate extreme heat, such as cooling systems, can benefit firms.

Adhvaryu et al. (2020) estimated the productivity consequences of adopting energy-saving technology (LED lighting) using daily production line-level data from large garment firms operating factories in and around Bengaluru. The garment factories initially used incandescent bulbs, the heat emanating from which would increase temperatures on production floors, affecting workers' productivity, especially on exceedingly hot days. The authors show that introducing LED lighting on factory floors contributes less heat to the factory environment and thus attenuates the negative relationship between mean daily outdoor temperatures and productivity. Specifically, introducing LEDs eliminates roughly 85 percent of the negative impact of temperature on worker efficiency during relatively hot days, which accounted for firm-wide productivity increases and shifted the overall break-even point for the firm from over three and a half years to less than eight months.

Most major cities in India have faced increasingly worsening air quality. In 2022, India had 14 out of the 20 most polluted cities in the world with fine particulate matter (PM 2.5) concentrations (*Hindustan Times* 2022). There are clear consequences for health, such as decreased lung function, vision problems, and cognitive difficulties for people who live in these areas and breathe polluted air over long periods, which could generate substantial productivity losses for workers and firms. For example, the Clean Air Fund (2019) estimates that India loses three percent of its GDP yearly due to air pollution because of workers falling sick and decreased footfall for businesses when people stay home.

As it is often implausible to eliminate the cause of air pollution, managers must develop strategies to deal with unforeseen absenteeism when it affects a worker's health. To better understand which characteristics enable managers to best cope with air pollutants to ensure their workers remain productive, Adhvaryu et al. (2022a) studied how productivity was affected because of particulate matter (PM) pollution. The researchers used detailed firm administrative data on managers and worker productivity, and survey data that captured task assignments and managerial characteristics. In addition, air pollution measurements were collected using five particulate matter monitors (PM) positioned at different locations in a garment factory. The monitors were placed to measure impacts using fluctuations in exposures to PM levels that vary at the line segment-by-hour level. The results show that sizable particulate

matter pollution shocks are commonplace and that worker- and line-level productivity suffers during these shocks. This relationship between pollution and productivity is small and linear; a one-standard-deviation increase in pollution decreases efficiency (a standardized productivity measure in the ready-made garments sector) by half a percentage point.

Further event study analysis confirms that large pollution shocks immediately affect worker productivity, with impacts varying across the tasks the worker performs and the worker themselves; impacts are 60 percent larger for workers performing complex tasks and 35 percent larger for older workers. In addition, they also find differences in how workers are allocated to tasks in production lines. Managers who notice productivity declines in particular workers may find it optimal to re-assign these workers to tasks in a way that reflects the limited ability of affected workers to exert effort in their assigned jobs. The probability of task re-allocation on production lines increases by three percentage points following a one-standard deviation increase in pollution. This shows that during a "pollution shock," workers are allocated away from the tasks that they are (idiosyncratically) "best" at in non-shock periods. This is because pollution shocks affect workers' performance most for baseline high-efficiency tasks; it may be optimal for managers to assign workers to tasks they are not well suited to, especially in the absence of shocks.

In sum, ambient temperature and air quality can significantly influence workers' well-being and productivity, especially in low-income countries. With the increased pollution and extreme heat due to climate change, workers' health and productivity are at risk. Poor air quality in India has been linked to health issues such as lung problems and cognitive difficulties, leading to productivity losses. Studies have shown that elevated pollution levels and temperature directly affect workers' efficiency, more so in labor-intensive industries. However, investing in solutions such as cooling technologies and energy-saving lighting can mitigate the negative impact of these environmental factors. Adaptive management strategies, such as re-assigning workers to different tasks during pollution spikes, can help maintain productivity. Investing in environmental adaptations and responsive management can be crucial for safeguarding workers' health and ensuring productivity in the face of environmental challenges.

### *3.4. Category 4: Managerial Quality*

Managers play an essential role in firm performance. Hiring and training good managers can help improve workers' well-being, boost productivity, and ultimately improve the firm's profitability. In Bloom et al. (2013), the authors ran a large multi-plant RCT with textile firms in India. The treatment, consisting of a five-month management consulting training, covered modern management practices for textile firms. Within the first year of running this intervention, firm productivity increased by 17 percent, raising annual profit by over $300,000.

When the authors followed up on these firms eight years later, treated firms showed lasting impacts on productivity, which was 35 percent higher than the control group.

Recent work in India also sheds light on the relationship between managerial quality and productivity. Adhvaryu et al. (2023d) study what aspects of managerial quality are most related to performance and what workplace policies might allow for better selection and training of managers. Researchers observe that productivity among garment factory workers increases as teams spend more time making the same type of garment, with learning occurring faster when teams work on new orders. Teams also retain what they had previously learned (from making prior similar garments), and this knowledge decays over time. Their study leveraged survey data from managers of around 120 production lines and complemented this with two years of granular productivity data. They find that managerial attention and control are the most important for enabling line productivity, both more impactful than traditionally emphasized dimensions like cognitive skills and tenure. Better managers contribute to productivity by allowing faster learning-by-doing by workers. These results show that what makes a good manager depends on the firm's needs. Similarly, the quality of a manager is variably defined. In certain situations, specific management practices matter more than others, and considering these differences helps firms train their workers effectively.

Building on this work, Adhvaryu et al. (2023b) evaluated the impacts of a nine-month soft skills training program administered to garment production line supervisors in a set of Indian garment factories. For workers in these production lines, their interactions with the supervisors are a considerable portion of their day-to-day life and their experience with work. Having a more effective manager may increase productivity as well as the compensation of workers. The training focused on the individual competencies of the supervisor, followed by their roles as supervisors, team members, and, ultimately, leaders. After randomizing access to this training program for workers and supervisors, the researchers found that lines supervised by trained supervisors were 7 percent more productive during training and 6 percent more effective post-training. Trained managers were 15 percent less likely to quit. The results of this study point to competing incentives of middle management, particularly around the costs of supervisory turnover, as one of the causes of the misallocation of training.

Studies on managerial quality also document how differences in attitudes towards managers may impact managerial effectiveness, irrespective of skills and/or managerial training. In Macchiavello et al. (2020), the researchers ran an experiment in Bangladesh where male and female candidates at the margin of promotion were promoted to supervisory positions. Their study found that female supervisors initially have lower productivity and evaluation from subordinate workers than their male counterparts. These gaps disappear after

4-6 months. Initial worse performance stems from negative beliefs of (majority female) workers about the abilities of female supervisors, which then corrected itself over time the more they were able to work with their manager.

Adopting productive management practices and improving the managerial skills of supervisors can significantly increase worker productivity and firm profitability. Emerging evidence demonstrates that improving managerial quality can generate considerable productivity increases. Some supervisory skills training programs have improved labor relations and narrowed the gender gap in managerial leadership. However, changing practices may face resistance from workers and result in adverse short-term effects on productivity. In addition, firms must design programs that actively fit their needs, given the size and skill level of the managers they hire.

## 4. Why Don't Firms Invest More in Workers?

Given the documented causal impacts of worker investments in various types of productivity and, in many cases, the documented substantial returns on such investments, why is firm investment in the workforce, in general, quite low? We review several potential explanations below. This area of inquiry requires more rigorous empirical investigation to understand which barriers to adoption are most salient in various contexts.

### *4.1. Information Frictions*

A lack of worker investment within a firm may be explained by a lack of knowledge or awareness of how vital worker investment is and the impacts of this on workers' well-being and firm productivity. Such misconceptions lower the perceived value decision-makers have surrounding worker investments. This idea has received some recent attention in the public sector. Hjort et al. (2021) study the adoption of best practices by Brazilian mayors in the policy-making process. They find that mayors are willing to pay to learn the results of impact evaluations and incorporate these findings into their knowledge base when making policies. Informing mayors about research on the impacts of reminder letters for taxpayers increases the probability that their towns implement such a policy by ten percentage points, suggesting that information frictions are quite salient in the non-adoption of best practices identified by research.

Sometimes, even if decision-makers are aware of necessary or helpful information, friction between agents may lead to an inefficient flow of information between parties, leading to information friction. Improving this information friction through improved communication flows between workers, for instance, can help firms institute crucial investments for their well-being. In Sandvik et al. (2020), researchers studied call center workers in the U.S.,

running an RCT to test whether improving knowledge flow across workers improved productivity. Workers were assigned to random meetings with their peers in which they discussed sales techniques. The results showed that the sessions significantly improved employee performance as measured by revenue per call. In Menzel (2021), the researchers ran a similar experiment with three Bangladeshi garment firms. Supervisors overseeing a "non-first style" (a style of garment already produced elsewhere in the factory) production line were randomly required to meet with the supervisor of the original line. As a result, productivity on the first day of the new line was higher. These results show that information frictions may result from information blocks due to a lack of knowledge or an incorrect valuation made by a firm; sometimes, improper communication pathways within a firm may contribute to or exacerbate this problem.

### *4.2. Risk Aversion*

It has long been theorized that worthwhile investments may be forgone if there is uncertainty in the value of investments and decision-makers are risk-averse, especially in developing countries where the consequences from an unfruitful investment may be disastrous (Stiglitz 1969; Banerjee 2004; Banerjee and Duflo 2011; Mobarak and Rosenzweig 2012; and Katreniak et al. 2023; for a recent review). This might lead firms to classic under-experimentation (as compared to a risk-neutral decision-maker) with investments in workers that might, on average, be very profitable. For example, Mobarak and Rosenzweig (2014) and Karlan et al. (2014) randomly give micro-enterprise farmers access to insurance in India and Ghana, respectively, mitigating their risk to weather shocks, and find that they invest in higher-yield but riskier crops. Studying small and medium enterprises in Vietnam, Do and Bui (2022) found a positive correlation between risk-loving attitudes and the likelihood of investing in human capital training for employees. This is similar to under-investment in other realms, for example, in decisions to engage in temporary migration (Bryan et al. 2014).

### *4.3. Limited Attention*

Managers typically have a limited amount of attention that they can allocate toward activities within their span of control. Managerial inattention could impede the ability of the firm to either invest or implement effective strategies that seek to further worker productivity. A growing body of evidence supports the general idea of managerial inattention being salient for productivity within firms. For instance, in the research highlighted above, Adhvaryu et al. (2022a) find that more attentive managers (i.e., managers who monitor frontline workers more frequently), or perhaps managers whose idiosyncratic attention costs are lower, are more likely to relocate workers in response to adverse worker-level productivity shocks from pollution exposure and are better able to mitigate

productivity losses on their lines. Similarly, in Bandiera et al. (2020), working with CEOs in six different countries, including India, the authors show firm performance is positively correlated with the amount of time CEOs spend in high-level, multi-function meetings rather than production activities. Finally, Lemos and Scur (2019) show that family-operated firms, for whom the attention of top management is often stretched thin, given that the firm control is limited to family members, display less adoption of structured management practices and worse firm performance. These various studies suggest the important role that scarce managerial attention can play in reducing productivity, perhaps through the reduction of attention on profitable investments in workers.

### *4.4. Misalignment of Incentives*

Conflicting interests at varying levels of the firm hierarchy may cause friction in adopting profitable practices, including investment in workers. For example, Atkin et al. (2017) introduced a new technology to make soccer balls more efficiently to 35 firms in Pakistan. Only six firms adopted the technology 15 months into the trial. Through conversations with employers and workers, they found that while the new technology would have reduced waste and sped up production (both parties knew this), workers found ways to discourage adoption because their incentives were not aligned with greater firm performance. The researchers conducted a second experiment to address this misalignment: employees received a bonus of a month's salary if they demonstrated the productivity benefits of the new technology in the presence of their employers. This generated a significant increase in adoption by firms, suggesting that a conflict of interest within the firm had been at least partially responsible for the initially slow adoption.

Similarly, in a study discussed earlier related to managerial training (Adhvaryu et al. 2023b), middle managers were asked to nominate their supervisors for the managerial training program. Randomization was then done within nomination ranks, thus allowing for the identification of heterogeneous effects by middle manager nomination categories. The researchers found that supervisors who were highly recommended by their superiors actually had zero treatment effect on productivity, but a large treatment effect on retention. Low-recommendation supervisors showed exactly the opposite effects: they had large improvements in productivity but almost no impact on retention. The researchers made sense of these results by elucidating a wedge between the incentives of the firm's upper management, which cares about maximizing firm productivity alone, versus middle managers, who care about productivity but also have high personal costs to supervisory turnover in terms of finding and onboarding replacements. Thus, recommendations deviate from the optimal in terms of productivity gains because supervisor retention is particularly valuable to middle managers. This divergence in incentives could lead the firm to conclude that supervisory

training is not very effective (if highly recommended supervisors were alone given access to the training), and generate non-adoption of an otherwise very profitable investment.

### *4.5. Turnover Erodes the Value of Investing in Workers*

Becker (1964) famously contended that firms in perfect labor markets should not invest to train their workers in general skills. This might lead to under-skilling in equilibrium if, for example, workers are very credit-constrained, as they might be particularly in low-income country contexts. Becker distinguished the skills a worker can learn on the job and the different valuations of these skills in the labor market as either specific or general. *General skills* are defined as those that are useful to all employers. In contrast, specific skills only increase a worker's productivity in their current job. He remarked that when labor markets are perfectly competitive, workers would be the sole beneficiaries of the improvements in their productivity, i.e., if training increased marginal productivity, the labor market would ensure that firms would have to pay these workers more, or they would leave and earn more elsewhere as a result of their increased marginal products. This would mean the return to the firm from training in general skills would be zero. Thus, there is no economic incentive to invest in workers' skills from the firm's point of view when labor markets are perfect; workers would have to invest in their own skills to improve their productivity. Under different assumptions of frictions in the labor market (in the form of information asymmetry, slow employer learning, or search frictions), however, as Acemoglu and Pischke (1999), Autor (2001), and others have pointed out, there could in equilibrium indeed be a wedge between workers' wages and marginal products, setting up a rent from general training for the firm. Therefore, under-investment in worker skills could arise in equilibrium if labor markets were fluid enough.

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https://youtu.be/BORqUv0jaKE

# Comments and Discussion*

Chair: **Rana Hasan**
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It was a pleasure to read this paper. I first summarize the main findings and discussion in the paper and thereafter offer some suggestions.

The authors carefully uncover the levels and trends in labor productivity in the Indian manufacturing sector. They first show that India's labor productivity is three-fifths of that of the US even after purchasing power parity adjustment. Not only has this been low historically, but it has also been declining over the last decade, particularly before the COVID-19 pandemic, as noted by the authors. Clearly, this does not bode well for India's manufacturing sector. The geographical variation in labor productivity is also intriguing—States in western and central India tend to have the highest average labor productivity—showing that spatial variation perhaps needs greater attention in future work.

Next, the authors show a positive association between worker emoluments in a firm, including the value of benefits provided by the employers, and labor productivity. They contend that this dimension of possible productivity enhancement through greater employer investment in workers in manufacturing, has not received much attention as compared to factors like capital misallocation and regulatory requirements.

This provides the primary motivation for this paper to further examine the nature of investments which have been shown to increase worker output. The emerging evidence discussed in the paper regarding interventions which can increase labor productivity is extremely informative and relevant for businesses when deciding how to invest in increasing worker productivity. This directly extends the copious and excellent work done by the authors over the past many years on what works to increase worker productivity in firms.

The authors begin by noting four broad types of interventions which have been tested in the literature—improving soft skills of workers, providing voice to workers to improve workplace relationships, managerial quality, and

* To preserve the sense of the discussions at the India Policy Forum, these discussants' comments reflect the views expressed at the IPF and do not necessarily take into account revisions to the conference version of the paper in response to these and other comments in preparing the final, revised version published in this volume. The original conference version of the paper is available on NCAER's website at the links provided at the end of this section.

environmental conditions. Studies evaluating the impact of soft skills find a 7-20 percent increase in worker productivity, as measured through ratings, output, and profits. Interestingly, these studies find that targeting soft skills at a younger age can increase test scores and reduce school dropout too. These findings show that these interventions in school can have a broader impact on labor productivity when these individuals enter the labor market. Importantly, these have been shown to be more beneficial for women who gain access to negotiation skills and confidence through such trainings.

The second strand of research discusses the impact of improved voice of workers in terms of having them evaluate their managers. This reduced worker turnover though it had no impact on productivity or profits. The authors then discuss the findings from their studies in India. In one study, workers randomly filled an evaluation form for their supervisors and about their overall job satisfaction, in the aftermath of a small wage increase. In the second study, the workers were randomly registered on a platform that allowed them to send anonymized feedback to the HR department. Both studies show a decline in quit rate or reduced turnover—factors that managers really care about—but no effect on productivity.

The third literature examines the impact of improving work physical environment on worker productivity. For instance, studies that randomly assign workers to more ambient temperatures and switch heating sources from incandescent bulbs to LED bulbs, which decreases the heat generated, find an increase in worker productivity and firm profits. Thus, managing environmental risks is important for increasing worker productivity.

The last set of studies examine the role of improving managerial quality. Here, the nature of intervention is shown to be important. Greater provision of trainings, which improve supervisor–worker relations by imparting effective leadership and communication skills, improves workers' satisfaction when direct supervisors are trained. On the other hand, training higher order supervisors increases firms' profits and productivity too. Another training focused on teaching record-keeping and storage practices found expansion of production activities and a decline in the inventory of firms, with overall growth of firms, three years after the intervention. Increasing information flow among workers, by randomly having supervisors have their experienced workers interact with the new workers was also shown to increase worker productivity of new workers.

The authors end with the question about why despite high returns to investment in workers, firms do not seem to invest in these productivity-enhancing interventions. They propose the following four possible factors behind this—lack of information among firms about the benefits of investing in workers, potential risk in returns which accrue to the firm after such investment, limited attention span of managers which may lead to under-investment by them in workers, and higher turnover risk when workers are better trained.

They discuss studies which show each of these possible reasons behind under-investment in workers by firms.

My suggestions are along four dimensions—motivating the human capital investment channel in explaining cross-country productivity differences, considering, or discussing the role played by firm size in explaining the differences, extending the empirical strategy to measure the association between worker investment and labor productivity in India, and synthesizing the existing evidence presented from other studies on interventions into cost-benefit analyses.

## Motivation: Importance of Human Capital Investment in Explaining Cross-Country Labor Productivity Differences

The authors begin by noting the labor productivity differences between India and the US, and then delve into the role played by human capital in possibly explaining it. A discussion on existing evidence around other factors, which can also possibly contribute to the productivity difference—technology and physical capital—would enrich this discussion further. Caselli (2005), Hall and Jones (1999), and Klenow and Rodríguez-Clare (1997) discuss the role played by technology or Total Factor Productivity (TFP) in explaining productivity differences across countries. But Acemoglu and Dell (2010) find that human capital differences contribute almost half of the variation in productivity in the Latin American countries.

Hall and Jones (1999) further delve into the social capital channel explaining the differences in technology and human capital productivity across countries. A higher level of social capital—defined as "lower levels of corruption, risk of expropriation, and government repudiation of contracts, while having higher levels of bureaucratic quality and law and order"—is shown to increase investments in education and technology. This is because of reduced misallocation of resources. Restuccia and Rogerson (2008) and Hsieh and Klenow (2009) for India show that TFP variation plays a major role in explaining differentials and the TFP in countries like India is lower because of misallocation of capital within the country. This can result from policies which distort incentives for firms to access credit or regulations that inhibit access to capital based on marginal productivity of enterprises.

Thus, apart from human capital productivity, other factors can also play a role in explaining the lower labor productivity in India. Notably, most studies rely on income per capita to measure labor productivity and few like Hsieh and Klenow (2009) use data specifically from Indian manufacturing enterprises. Nonetheless, a motivating discussion on why human capital differences—which are not accorded as much importance in the literature in explaining the cross-country differences—may be an important contributor in explaining the

variation will be informative for readers before the micro level evidence on how human capital can be increased is discussed.

## The Role Played by Firm Size

Second, it is well known that firm size in India is much smaller than in the developed countries. For instance, 95 percent of manufacturing enterprises have less than ten employees, and 77 percent of manufacturing employment is in enterprises with less than ten employees (Sixth Economic Census, 2012-13). On the other hand, this figure stands at less than 10 percent for the OECD countries. The reasons behind the small firm sizes can be regulatory. From an accounting perspective, if one were to allow firm size to be similar in India versus the US, how much would the labor productivity differences between the countries remain unexplained? One way of implementing this could be re-weighting the ASI enterprises so that firm size distribution matches that of the US.

The link between firm size and labor productivity can be explained through many channels—smaller firms have lower access to capital and are less likely to adopt new technology. They are also less likely to invest in training, managerial quality, or mitigating environmental factors due to size constraints. In a recent paper, we show that bigger firms are more likely to offer on-the-job training and other benefits that workers value (Chakraborty and Mahajan, 2023). Thus, discussing this channel more has direct policy implications for providing incentives to increase firm size in India. A discussion on what proportion of firms make any investment in employees would also be a useful statistic for the discussion on why less firms invest in workers.

## Identification Strategy

Third, using data from the Annual Survey of Industries 2019-20, the authors show that increased worker emoluments (wages and benefits) are associated with higher labor productivity. Since wages are affected by labor productivity as well, my suggestion would be to exclude them from the measure of emoluments. This exacerbates the endogeneity concerns in their regression framework. While they duly accept reverse causality between wages and labour productivity, some effort can be made to mitigate this.

One, authors can use only data on expenditures on benefits by the employer—"direct expenditure on maternity, crèches, canteen facilities, educational, cultural and recreational facilities; and grants to trade unions, cooperative stores, etc., meant for employees"—as a measure of worker investment. They can exploit the panel structure of the data and use firm fixed effects to reduce firm-specific unobserved heterogeneity.

## Synthesis of Findings from the Interventions on What Increases Labor Productivity

The authors discuss various interventions—soft skills training, increasing information flows between workers, providing voice to worker concerns, improving workplace climate and direct environmental conditions in which workers operate as well as improving the managerial quality by training—and the magnitude of their impacts on firm outcomes. While the depth of the discussion is extremely informative, what may be further useful for firms or for policymakers who launch various initiatives to increase firm productivity is a cost-benefit evaluation summary of these interventions.

To conclude, the paper discusses the extremely relevant and important topic of lower labor productivity in India. It suggests ways to improve it through increased human capital investment by firms. With additional motivation of why this channel is important in explaining differences in cross-country labor productivity, it has the potential to influence decision-making by both firms and governments in India.

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## 1. Introduction

This is a thought-provoking paper that connects the phenomenon of the slowdown in manufacturing productivity in India at the macroeconomic level and its wide dispersion across the country, to a hypothesis at the microeconomic level: this may be due to firms insufficiently investing in their workers. The paper must be praised for taking on an important policy-relevant question, offering an interesting hypothesis, and providing both macro- and micro-level evidence in support of it.

For the macro part of their argument, the authors use data from the Annual Survey of Industries (ASI) and define productivity as revenue per worker and 'emoluments' as the measure for firm investment in workers. ASI defines emoluments as the sum of wages and salaries, bonuses, employer's contribution to Provident Fund, and various perks, namely, all goods and services provided to workers free of cost or at a subsidized rate ranging from healthcare to festival bonuses.

The paper documents that the growth rate of productivity shows a sharp downward trend since 2015. It shows that there is a big dispersion across States and industries within India, and that productivity is strongly correlated with firm investment in workers, even when we stick to comparing firms within the same industry and located in the same state.

The paper is very careful in not making any causal claims about the link between productivity slowdown and investment by firms in worker productivity at the macroeconomic level. Nor does it make any grand claims that it is a magic bullet and that if firms start investing in the productivity of their workers, the slowdown in productivity growth might be reversed at the macroeconomic level. In fact, the paper explicitly notes that unobserved choices of the firm may be correlated with both wage and other forms of benefits to workers, as well as productivity from the macro-level evidence they provide, and this forms the basis of the paper turning to micro-level evidence, which is much more rigorous from the causal point of view. It provides a very lucid and engaging review of an emerging literature that provides causal micro-level evidence on firm investments in worker productivity or factors that facilitate these investments on firm productivity. This evidence is mostly based on Randomized Control Trials (RCTs) drawing on the work of the authors as well as others. The examples of factors that are experimentally varied are soft skills of workers, giving workers more voice, improving the physical environment of workers, especially regarding extreme heat and pollution, and managerial quality. The evidence all points to net gains from investment in these dimensions for firms in terms of productivity.

This naturally brings up the question: Why don't then firms invest in their workers? The paper discusses several reasons, which are mostly microeconomic in nature, focusing on an individual firm's incentives. They include information frictions (firms may lack awareness of the benefits of investing in workers), risk-aversion (uncertainty about returns and outcomes might discourage investment), limited attention of managers (managers might not focus on long-term investments), and misalignment of managerial incentives (even if beneficial for the firm, managers may not prioritize worker investments as their interests and the firm's overall profitability may not be aligned due to agency problems). The paper ends by discussing a more macroeconomic channel as to why firms may not optimally invest in the productivity of their workers that goes back to Gary Becker's (Becker, 1962) insight that to the extent that these productivity gains for workers are 'portable', which would be the case for general skills, firms do not recoup the benefits from these investments due to the presence of worker turnover. A more recent literature in Labour Economics, such as the paper by Acemoglu and Pischke (1999) that the paper cites, has shown that even in the presence of labor market frictions, to the extent labor markets are fluid enough, the problem of firms under-investing in worker skills may result.

I have two sets of interrelated comments on the paper, presented in Sections 2 and 3 below. In Section 2, I try to place the argument in the context of the overall macroeconomic environment of India. A natural question that arises is whether firms are not investing in workers because the overall macroeconomic environment has been stagnant, in general, and, for the manufacturing sector, in particular. Therefore, the paper's macro-level evidence that finds a strong correlation between firm investment in workers and productivity could be due to reverse causality—lower productivity implies lower investment in workers. In Section 3, I suggest a theoretical explanation that is consistent with both the macro- and micro-level findings of the paper, namely, that firms invest less in workers when labor markets are slack since they can afford to do it as the outside options of workers are not great, whereas when labor markets are tight, firms must invest in their workers to retain them and stay competitive. In Section 4, I make some concluding remarks about a very interesting research agenda that this paper points to.

## 2. Placing the Argument in the Context of India's Overall Economic Trajectory

I would like to place the argument presented in the paper in the context of the macroeconomic environment in India in the recent past to make two points. Could there be an interpretation that reverses the line of causality that the authors posit, namely, could declining productivity (as measured by revenue per

worker in the paper) be driving diminished investment in workers? This could be the case if there are general factors operating at the macroeconomic level driving an overall decline in investments of *all kinds* by firms due to diminished profitability, which would show up as diminished productivity.

There was a clear deceleration of the growth rate of per capita income over the last decade compared to the previous one (Nagaraj, 2023). If one looks at growth since 2000, the average growth rate was lowest in the last five years (excluding the pandemic year) as compared to the previous five-year intervals and the signs of growth slowdown had become apparent before the pandemic. This was particularly noticeable for the manufacturing sector, with the growth rate steadily declining since 2015, and hitting negative numbers in 2019. If we leave aside the pandemic year and the recovery year following it, for the very last year for which we have data, namely, 2022-23, the annual growth rate of value added in manufacturing was 1.34 percent, the lowest among the other sectors. Signs of a generally stagnant macroeconomic environment in manufacturing is reflected in the steady decline in the investment-to-GDP ratio over the last decade after it had grown for three decades. The share of manufacturing in total output as well as employment has been stagnant.

There are several possible explanations for the stagnation surrounding the manufacturing sector. There could be demand-side factors that are constraining the market size and incentive of firms to invest in capacity and productivity due to rise in inequality (for example, Ghatak, Kotwal, and Ramaswami, 2020). There could be supply-side factors that have to with greater regulation, more stringent enforcement of existing regulations, macro-level shocks like demonetization, and introduction of GST that could also reduce the investment incentives of firms. It is beyond the scope of this discussion to delve deeper into the causes behind it. However, given the evidence on the general signs of slowdown in the manufacturing sector, it is reasonable to ask whether the direction of causality that the paper posits at the microeconomic level—namely, investment by firms in workers may lead to gains in productivity—could, in fact, be running the other way around, namely, because of the stagnant macroeconomic environment facing the manufacturing sector, the profitability of undertaking investments of any kind by firms is down. If the firm's production function has a multiplicative productivity parameter , then a fall in would lead to a reduction in all its input (including investment) choices. In other words, firms may be doing less of many other things (investing in plants and machinery, adopting new technology, marketing, seeking export markets) and that raises the question: How important is the specific component that the authors focus on (investing in workers) in explaining overall low productivity levels? Reverse causality is not just an econometric concern here but could be economically of first-order importance, and so, while looking at this micro-channel is useful, it is also important to keep the underlying macro-factors in mind.

## 3. Factors Influencing Firms' Investment in Workers

I want to make a constructive suggestion about how the core argument of the paper—namely, the investment by firms on workers may boost productivity—can be formalized using a simple microeconomic argument about the incentive to invest by firms and how it depends on the economic environment. In particular, we will focus on the state of the labor market as that determines the outside option of workers, and how firms decide on how much to invest on their workers partly depends on whether the labor market is tight or slack, because that determines the likelihood of turnover.

In the spirit of the argument presented in the paper, let the firm's productivity parameter be a function of investments in workers, denoted by x. Let the relationship be described by a function $\theta A(x)$ which is increasing in x but subject to diminishing returns, and θ is a multiplicative parameter capturing all factors at the macro, industry, and firm level that affect its productivity. Let the cost of undertaking this investment be denoted by c(x) which is increasing and is subject to increasing marginal cost. Let w be the wage paid to a worker. For simplicity, let us assume that the worker supplies one unit of labour. Workers have an outside option $\bar{u}$ which captures the expected payoff from finding another job, which depends on the probability of finding an alternative job p and the payoff conditional of finding such a job, u. In other words, $\bar{u} = pu$, Let b(x) be the direct gains that the worker receives from these investments, which reflects their payoffs from staying in this job in addition to receiving a wage. This would, for example, be the gains from having better work conditions or emoluments. One can also think of anything that reduces the disutility or discomfort of working conditions as a benefit.

The participation constraint (PC) for the worker, as is standard in models of the labor market, says that the worker's valuation of the firm's offer of wages and other benefits of the job must not fall short of the worker's outside option, or else he or she will quit:

$$w + b(x) \geq \bar{u}.$$

The firm's objective function is to maximize its profits:

$$\pi(x) = \theta A(x) - c(x) - w$$

by choosing w and x subject to the participation constraint $w + b(x) \geq \bar{u}$. If the participation constraint is binding, then we can substitute $w = \bar{u} - b(x)$ is the firm's objective function and find the following condition for profit-maximization:

$$\theta A'(x) + b'(x) = c'(x)$$

In other words, the firm is setting the marginal gains from the investment to itself and to the worker equal to the marginal cost, and that gives an efficient level of investment. The intuition is, if firms can cut wages to adjust for the additional

benefits workers receive due to these investments, they effectively internalize the benefits from the investment that goes to the worker and therefore, invest at an efficient level. However, if due to labour regulations or efficiency wage considerations (whether due to nutrition-based reasons or reasons of providing a wage premium to discourage shirking), wages cannot be cut below a certain lower threshold, then this argument does not work. Suppose even when wages are at the minimum possible level $\underline{w}$, workers earn more than their outside option $\bar{u}$. This is a plausible scenario in a labor-surplus economy. In that case, the participation constraint could be slack even if x is low (say, x=0) and w = $\underline{w}$, namely, $\underline{w} + b(0) > \bar{u}$. Then the firm's investment decision will be given by

$$\theta A'(x) = c'(x)$$

that is, they will under-invest as compared to tight labour markets.

Observe that we took a very simple model that does not consider dynamic considerations that the existing literature referred to earlier and discussed in the paper has focused on. We also ignored, among other things, externalities, general versus specific investment, and behavioral/learning issues. In our simple static model, we saw how labor market conditions, including tight or slack markets, to the extent it determines whether participation constraints are tight or slack, can influence investment decisions by firms. If labor markets are tight, firms will invest more in workers even if some of the benefits accrue to workers and cannot be directly captured by firms. But if labor markets are slack, employed workers earn a 'rent' since getting another job is not easy, firms will only look at their profits in making such investments and ignore the positive impact on workers, thereby leading to under-investment.

We argue that given the overall stagnant environment in the manufacturing sector that we described earlier, it is unlikely that the labor market would be booming. Indeed, data on employment suggest that since 2012, formal manufacturing employment as a percentage of the total employed persons has hovered at around 5 percent. Moreover, the overall trends in the labor market (see Ghatak, Jha, and Singh, 2024, for a review) do not indicate any significant rise in job creation or increase in real wages. Therefore, the environment is more likely to resemble a situation where the participation constraint of workers is slack, as opposed to tight, and that would imply lower investment by firms.

## 4. Conclusions

To sum up, the paper highlights the relationship between worker investments and productivity growth in the context of stagnating productivity in the manufacturing sector in India and offers an interesting channel that could be responsible, namely lower firm investment in worker productivity. It also connects macro-level evidence on stagnant manufacturing productivity and

variation in productivity across States to the measure of investment in worker productivity from ASI data to micro-level evidence drawn largely from randomized experiments to suggest methods for enhancing firm investment in worker productivity.

The paper presents findings from a very interesting research agenda about the relationship between firms' investment in workers and productivity. None of the points I raised suggests that the arguments that the paper advances are incorrect. Rather, they suggest that there could be other forces at work, and one would need more evidence to distinguish between them and evaluate their relative importance. Moreover, given the richness of the experimental evidence that is already available, one can try to look for evidence on the alternative mechanisms at work and if the existing data does not permit nailing down the mechanism as rigorously as one would want, it suggests a very promising research agenda that can provide further insights on the relationship between firm investment in workers and productivity.

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## General Discussion

Pravin Krishna initiated the discussion by asking about the interventions that have been investigated. Specifically, he wanted to know whether the authors had analyzed the distinction between skill enhancements that pertain exclusively to individual workers and those that are more aligned with the needs of the employing firms. He also asserted that if companies invest in workers with a focus on cultivating skills uniquely suited to the operational demands of the firm, these firms could internalize the advantages stemming from these skill enhancements, thereby mitigating possible challenges. An alternative scenario could be one in which investments are directed towards nurturing

more generalized skills among workers. An intriguing observation, arising from one of the studies mentioned by the authors, was that despite a noticeable upswing in productivity, the anticipated increase in employee turnover did not materialize. This anomaly is especially perplexing given a situation wherein worker compensation falls below marginal productivity.

Devesh Kapur highlighted the trends in the organized sector, particularly services and Information Technology (IT), where the emphasis is ostensibly on investing in worker training, despite high turnover rates in the two sectors. Shifting focus to the manufacturing sector, he drew a cross-country comparison, noting that Germany and Japan stand out for instituting industry councils with clearly defined roles in their respective manufacturing sectors. These councils serve as platforms for disseminating information among member organizations, akin to the Confederation of Indian Industry (CII) in India. An analysis of the functioning of the German and Japanese councils could also serve as best practices for their counterparts in India. He also alluded to research undertaken during the 1920s and 1930s, which compared the productivity of cotton textile mills in India with their Japanese counterparts. This analysis revealed a considerable productivity gap, indicating the better performance of Japanese mills, as a result of which Indian companies were losing their market share to their Japanese counterparts. He finally suggested that an analysis of the impact of unions and their role in shaping both firm incentives and worker behavior in India's manufacturing sector, was missing in the paper. The establishment of the National Productivity Council by the Indian Government is aimed at addressing these concerns and disseminating best practices among firms.

Ratna Sahay commented that the paper could have examined distortions in India's labor market arising from stringent labor laws and intentionally maintaining small firm sizes to ensure that the latter do not fall under the ambit of certain labor laws. She also questioned whether soft skills and managerial practices were the primary drivers of China's manufacturing success, or if incentives and enforcement mechanisms had also played an equally crucial role, implying the importance of both micro- and macro-level factors in shaping policies for the manufacturing sector.

Karthik Muralidharan suggested that the reason behind Becker's concept of employees not quitting after acquiring skills could be due to their inability to effectively demonstrate those soft skills to external parties, especially skills that are not conventionally assessed. He also remarked that the work in the paper seems to be on the cutting edge of discovery, reminiscent of the advent of management consulting in the 1920s based on micro improvements to practices on factory floors. He also raised the following questions: Are other organizations or entities engaged in similar studies of workplace productivity? Do practitioners highlight such concepts which are then validated by researchers through testing? He further stated that 10-20 additional similar studies could help serve the broader public interest by influencing educational curricula in

business schools and other academic institutions. Reiterating Ratna Sahay's suggestion that soft skills alone may not have been the driving force behind the success of China's manufacturing sector, he argued that recent studies from China highlight the positive impact of giving workers a voice to enhance their productivity.

Seema Jayachandran wondered whether the subject aligns with government policy or industrial policy. She stated that the paper highlights the challenge of treating these ideas as public goods. She also flagged the issue of skill transferability, and the differentiation between soft skills and work condition-related skills, as well as the need for investing in other elements such as equipment upgrades to boost productivity in the manufacturing sector.

Rana Hasan commented on the perplexing issue of high labor productivity in some States such as Madhya Pradesh in contrast to lower productivity in the Southern States despite the prevalence of industries like Foxconn, Pentagon, and the auto industry in States like Tamil Nadu, Karnataka, and Telangana. The inclusion of regular and contract workers in the ASI data could be another reason affecting the firms' incentives to invest in training. It is also worth exploring if the presence of a few large firms like Cipla or Eicher Volvo is driving the higher productivity in Madhya Pradesh. This leads to questions about incentives, middle management, and the suitability of India's regulatory environment for smaller firms. He also wondered about the possibility of alternative methods for enhancing productivity beyond the proposed 12-hour shifts.

Maitreesh Ghatak pointed out that the Lewis model of rural-urban migration emphasizes migration despite wage premiums. This insight highlights the tension between the macro Indian scenario and the cutting-edge micro findings presented by the authors, which plays out in the broader context of rural-urban migration dynamics. He also stressed the need to address the following key question: How can firms be motivated to seek improvement and self-assessment, especially in labor-surplus economies where employee satisfaction might not be a priority? The transient nature of macro-shocks also impacts these challenges. He noted that understanding the frequency at which firms in the manufacturing sector experience failure provides a nuanced perspective on investment tendencies. Hence, if there is a strong aversion to failure in a particular firm, the latter may adopt a cautious approach, resulting in under-investment and failure to exploit potential opportunities for growth.

Ajay Mahal outlined the significance of a different model wherein training is provided by an external partner without a direct cost to the firm. This strategy could help in enhancing workers' skills and ensuring their retention by leveraging external expertise. Incorporating this external training model into the broader discussion can provide a more comprehensive view of the various strategies' firms employ to balance skill development, workforce retention, and overall productivity.

Prabhat Barnwal acknowledged that the authors had touched upon the crucial interplay between training programs, promotions, and the specific organizational structure of firms. In case of the existence of a significant number of frontline workers and only a few managerial positions in an organization, the decision to promote a few workers could foment tensions or perceptions of favoritism among the workforce. On the other hand, the complementarity between trainings and promotions can be used as an advantage by firms, as the prospect of career advancement can act as a powerful incentive for workers to actively participate in training initiatives. Firms too can benefit by imparting training to workers, which would equip them to handle greater advanced responsibilities, and create a skilled and motivated workforce. However, workers are more likely to value and actively engage with training only if they perceive a clear connection between the skills they acquire and their potential for personal growth and career advancement. This underscores the importance of charting comprehensive human resource strategies encompassing training, career development, and effective communication to create an environment wherein both the firms and their employees can thrive.

The session video and all slide presentation for this IPF session are hyperlinked on the IPF Program available by scanning this QR code or going to: https://www.ncaer.org/IPF2023/Agenda.pdf