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Competition and Social Identity in the Workplace: Evidence from a Chinese Textile Firm*

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Abstract

We study the impact of social identity on worker competition by exploiting the well-documented social divide between urban resident workers and rural migrant workers in urban Chinese firms. We analyze data on weekly output, individual characteristics, and coworker composition for all weavers in an urban Chinese textile firm during a 53-week period. The firm adopts relative performance incentives in addition to piece rates to encourage competition in the workplace. We find that social identity has a significant impact on competition: a weaver only competes against coworkers with a different social identity, but not against those sharing her own identity. The results are mainly driven by urban weavers competing aggressively against rural coworkers. Our results highlight the important role of social identity in mitigating or enhancing competition.

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1 Introduction

Social identity theory suggests that individuals derive part of their identity from their perceived membership in a social group and, as a result, behave differently toward in-group versus out-group members (Tajfel et al., 1971; Tajfel and Turner, 1979).[1] Social identity can play a significant role in economic decision making, leading to seemingly irrational economic behaviors (Akerlof and Kranton, 2000). Despite its importance in organizational contexts (Hogg and Terry, 2000), most empirical evidence on social identity comes from lab experiments, and few studies exist on the impact of social identity on worker behaviors in a real economic setting.[2] In this paper we provide novel evidence on the interplay between social identity and worker competition in a Chinese textile firm.

Since an individual's social identity may originate from multiple sources, capturing the effect of a particular identity can be empirically challenging. We overcome this challenge by exploiting a unique setting where a well-documented, deep, and exogenously-formed social divide separates otherwise similar workers. Like many typical urban Chinese manufacturing firms, our focal firm employs both rural migrant workers and urban resident workers as a result of one of the largest rural-urban migrations in history (Zhang and Song, 2003). An individual's "rural" or "urban" status is determined by a highly rigid household registration system (*hukou*), which is subscribed at birth and mostly permanent.[3] The allocation of social

[1] Tajfel (2010) formally defines social identity as "part of the individual's self-concept which derives from their knowledge of their membership of a social group (or groups) together with the value and emotional significance attached to that membership." Psychologists have accumulated a rich body of theory and evidence on social identity (e.g., Abrams and Hogg 1990; Van Knippenberg 2000; Hewstone et al. 2002).

[2] A series of lab experiments create artificial affiliations with "minimal groups" and find that they generate differential behaviors toward in-group versus out-group members (Bernhard et al., 2006; Charness et al., 2007; Chen and Li, 2009). However, Goette et al. (2012a) point out that findings from minimal groups may not generalize to situations where individuals have real social ties. Several experimental studies examine the impact of real social identities in a lab setting, including Fershtman and Gneezy (2001) on Ashkenazic and Eastern Jews, Hoff and Pandey (2006) and Hoff and Pandey (2014) on the caste system in India, and Afridi et al. (2015) on the rural/urban status in China.

[3] Chan and Zhang (1999) provide a comprehensive description of the hukou system. As of our study period (2003–2004), transfering a *hukou* from rural to urban was extremely difficult and usually required wealth, home ownership, business ownership, or enrollment in universities. The central government also imposed strict quotas on transfers, which were highly limited compared to the size of the eligible population.

resources heavily favors urban residents and discriminates against rural migrants, creating a powerful institutional divide between the two groups.[4] Other than the type of *hukou*, the workers in our sample have almost identical demographic characteristics such as gender, education, and ethnicity. We investigate whether the social identity derived from one's rural or urban status affects a worker's response to competition.

The upper management at SCT strives to create a competitive culture in the workplace and uses a combination of piece rates and relative performance pay to incentivize workers. Relative performance schemes have been found to generate intensified competition, diminished cooperation, and sometimes even sabotage amongst participants (Lazear, 1989; Drago and Garvey, 1998; Harbring and Irlenbusch, 2008, 2011; Carpenter et al., 2010). The presence of strong social identities suggests that a worker may compete against her in-group coworkers—defined as those who share the same social identity as the worker—differently from her out-group coworkers. More specifically, there are two potential effects that are not mutually exclusive: 1) social identity facilitates altruism and mitigates competition among in-group members; and 2) social identity creates a powerful "us versus them" mentality and intensifies competition across groups.

We measure individual workers' responses to competition based on how they react to their coworkers' presence. In our setting, there is no team production; each worker is responsible for her own output. Confounding the identification of coworker effects is the potential presence of common determinants of performance such as aggregate shocks. We address this empirical challenge by exploiting the exogenous fluctuations in the composition of workers in our firm due to employee turnover and temporary absence. Similar to Mas and Moretti (2009), we use panel data to predict a worker's time-invariant productivity (i.e., ability) based on estimates from a regression model with worker fixed effects. We then estimate how

[4]The vast majority of rural migrant workers in urban areas rely on temporary residence permits, which grant them only minimal access to urban social welfare benefits such as subsidized education and housing. Liu (2005) finds that compared to urban residents who inherited their *hukou* status, rural-born individuals who received an urban *hukou* later in life have significantly lower education attainment and fare worse in the labor market.

a worker's weekly performance changes when the average ability of her coworkers changes in that week. Neither the error term nor the worker's performance in a given week could influence the average ability of her coworkers, insofar as there is no systematic rule of assigning workers based on their ability. Our field research confirms that such random assignment is in place, and we also present econometric evidence on the absence of systematic assignment following the test developed by Guryan et al. (2009).

Using panel data on weekly productivity of 287 weavers during a 53-week period (April 2003–March 2004), our analysis reveals that a worker performs better only when working with more able out-group coworkers, but not when working with more able in-group coworkers. Furthermore, we find differential responses between urban and rural workers. Urban resident weavers are particularly sensitive to competition from rural migrant coworkers, whereas rural migrant weavers are less responsive to competition from urban coworkers. Our findings demonstrate the important role that social identity plays in mitigating or amplifying incentives that promote competition in the workplace.

Our findings are consistent with the prior experimental evidence from Goette et al. (2012b), who show that incentives that encourage competition at the group-level enhance prosocial and altruistic behaviors toward in-group members and generate antisocial and harmful behaviors toward out-group members. Different from their setting, the incentives in our setting are at the individual-level and incentivize a worker to compete against everyone.

We also contribute to the vast literatures on relative performance incentives (e.g., Lazear and Rosen 1981; Bull et al. 1987; Knoeber and Thurman 1994) and on peer effects (e.g., Kandel and Lazear 1992; Mas and Moretti 2009; Guryan et al. 2009; Chan et al. 2014). Our study is closest to Bandiera et al. (2005) and Bandiera et al. (2010), which provide compelling evidence that fruit pickers in the UK withhold effort when working alongside their friends under relative performance schemes and conform to the productivity levels of their friends under piece rates. They focus on endogenously formed social ties and show that workers respond to their friends' performance but not to that of the rest of their coworkers.

In contrast, we focus on exogenously-formed social groups and find that our weavers respond to their out-group coworkers, yet not to their in-group coworkers. The social divide between rural migrant and urban resident workers in China, induced by national policies and formed long before the arrival of workers at our firm, creates an intensified intergroup competition of "us versus them" in the workplace, likely to a degree that is more extreme than simple friendship. While social identity may lead to friendship and vice versa, they are clearly different social constructs (Hogg and Hains, 1998). Our study thus complements Bandiera et al. (2005) and Bandiera et al. (2010) in two ways: we shed light on a different form of social divide and point to intergroup competition as an alternative channel through which social identity affects the dynamics of worker interaction.

Finally, this paper relates to a small yet growing literature on workplace diversity and productivity. Charness and Villeval (2009), Kurtulus (2011), and Hamilton et al. (2012) supply evidence that heterogeneous teams are more productive than homogeneous teams, where diversity is based on ability, seniority, or demographics. In contrast, Hjort (2014) highlights the dark side of workplace diversity by showing that taste-based discrimination can distort the allocation of resources in a setting where ethnic groups are hostile to each other (a Kenyan flower production plant). In our context, the source of workplace diversity is similar to that in Hjort (2014), as our Chinese workers also belong to two deeply-divided social groups that are unfriendly to each other. Yet we derive opposite findings on the positive competitive effects of workplace diversity, suggesting that the interplay between social identity and competition is an important dimension that affects the implications of workplace diversity.

In the remainder of the paper, we describe our empirical setting in section 2 and the incentive scheme in section 3. In section 4, we test for random assignment of workers, present our regression estimates of coworker effects with social identities, and discuss the implications of our findings. We conclude in section 5.

2 Empirical Setting

The Chinese textile firm in our study, SCT, is based in a large industrial city in northeastern China, where textile manufacturing is one of its most prosperous industries.[5] SCT was originally a state-owned enterprise (SOE), but became one of the first large-scale SOEs to be privatized in 1998. In collaboration with two other researchers, we collected detailed personnel and productivity data that include personal characteristics, weekly performance measures, and wages for all weavers in the Weaving Division over the 53-week span between March 2003 and April 2004.[6] The dataset for our analysis contains 9,966 observations for 287 individual weavers.[7] We supplement the data with extensive interviews with several upper-level managers,[8] two department managers and a line supervisor (all from the Weaving Division), and a long-term consultant for the firm.

2.1 Performance metrics

At first glance, the firm's operation appears to be fully automated, as cloth is produced by automated looms rather than weavers. However, closer observation of the workplace reveals that weavers play an essential role in the production process. Problems such as broken threads occur from time to time. Each weaver's main task is thus to pay close attention to her assigned loom machines and minimize the occurrence of such operational problems. If problems arise, she must solve them quickly and effectively; the quality of her output depends on her ability to detect early problem signs and make timely adjustments to the operation process. SCT constantly emphasizes to their weavers the importance of quality

[5] Our confidentiality agreement with SCT prohibits us from revealing the actual name of the firm.

[6] SCT employed about 3,500 workers as of April 2004, but we do not have data on the workers in the other divisions, such as spinning.

[7] We dropped 12 weavers who have worked for only 1 week as well as 115 observations where the weaver worked for less than 2 days of the week, since we cannot accurately predict abilities for these weavers. We also dropped one outlier observation, where the defect rate was above 10% (the maximum in the rest of data is 2.5%) and its daily output was only 5 meters (the mean in the rest is around 500 meters).

[8] These include the Director of Human Resources, the Director of the Weaving Division, and the Director of Data Management (who was in charge of all internal data).

and asks them to work toward "zero defect".

Individual performances are recorded by machines and thus measured with little error. The firm keeps three performance-related records per week for each weaver: total output produced, days worked, and defective output produced.[9] From these three variables, we calculated the following two performance measures for weaver i in week t:

$$DefRate_{it} = \frac{DefectiveOutput_{it}}{TotalOutput_{it}} * 100, \quad (1)$$

$$DayOut_{it} = \frac{TotalOutput_{it} - DefectiveOutput_{it}}{DaysWorked_{it} * 10}. \quad (2)$$

Defect rate and average daily non-defective output measure the quality and quantity of output, respectively.[10] At the beginning of each week, SCT develops the upcoming week's production plan and assigns each individual weaver specific numbers for work days, total output, and defective output. These numbers allow us to construct planned defect rate and planned daily non-defective output in the same way following Equations 1 and 2. The correlation between planned and actual daily output is 0.9562, which means that workers typically conform to the plan in terms of production quantity. In contrast, the correlation between planned and actual defect rate is only 0.0957, suggesting that discretionary efforts are crucial for quality control. Given the problem-solving nature of the weaving job, we thus consider defect rate as our primary measure of productivity.

Panel A of Table 1 reports summary statistics of weekly planned and actual performance measures, number of days worked in a week, and average daily wage. On average, a weaver produces 545 meters of non-defective output in an 8-hour work day and has a defect rate of 0.24% per week. Although "zero defect" is emphasized in the workplace, there is no week during which a zero defect rate is actually achieved. As expected, the mean and standard deviation of the planned daily output are similar to those of the actual daily output, but the

[9]Every product is inspected for defects.

[10]We scaled the variables to make the regression coefficients more readable. Defect rate is in percentages, out of 100, and daily non-defective output is measured in ten meters.

mean and standard deviation of the actual defect rate are much smaller than the planned defect rate. A work day is defined as an 8-hour period so it is possible for a weaver to work more than seven "days" a week; the mean of days worked in a week is around 6.3. A weaver earns slightly less than ¥24 Chinese renminbi in an average 8-hour work period, which is equivalent to around $2.9 US dollars in April 2004.

2.2 Rural-urban social identity

An important feature of urban Chinese factories like SCT is the presence of rural migrant workers, who look for better economic opportunities in non-farming sectors in urban areas, sometimes far from home.[11] In 1958, China's central government created the household registration (*hukou*) system to tightly control labor mobility; efforts to loosen the rigidity of the system have been limited and made slow progress (Chan and Zhang, 1999). An individual's *hukou* identifies his or her permanent place of residence (*hukou suozaidi*) as well as whether the type of *hukou* is non-agricultural (urban) or agricultural (rural) (*hukou leibie*). *Hukou leibie* is inherited at birth within a household, and it is very difficult for a rural-born individual to obtain an urban *hukou* later in life, which usually requires wealth or higher education.

Social divide between urban residents and rural migrants has been well-documented. Survey results show that many urban residents feel hostile toward rural migrant workers, as they believe that rural migrant workers have taken jobs away from them and made the city increasingly crowded, dangerous, and dirty (Solinger, 1999; Nielsen et al., 2006). Urban resident workers also tend to discriminate against rural migrant workers in the workplace and prefer to communicate among themselves due to their common backgrounds and language (Lu and Song, 2006; Nielsen et al., 2006). Letters from female rural migrant workers in Shenzhen (one of the first coastal cities in southern China to experience economic reforms and a huge influx of rural workers), documented in Ngai (2005), suggest they feel that "no

[11] The proportion of rural individuals participating in off-farm work has risen from around 11% in 1980 to over 43% in 2000 (de Brauw et al., 2002).

matter how many years they spent there, in the drudgery of labor they would always be recognized as outsiders" and "disguis[ing] their rural identity could only result in reinforcing their class...differences." Using field experiments with Chinese elementary school students, Afridi et al. (2015) show that social identity derived from one's urban or rural status affects individual behaviors even at a young age.

SCT's personnel data record whether a weaver is an urban resident worker or a rural migrant worker based on the type of her *hukou*; no weaver's rural or urban status changed during our study period.[12] Our field interview with the Director of Human Resources confirms that the aforementioned sharp social divide between urban resident workers and rural migrant workers exists at SCT. Urban workers form their own community since they have shared backgrounds and have worked together at the firm for much longer.[13] Being more experienced with the firm may also reinforce any superiority over rural migrant workers that urban workers already feel as residents of the city. For rural workers, the social divide is further intensified by their living arrangements. The rural weavers at SCT are mostly young single women from villages in the same province as the firm, and they all live in the company dormitory free of charge (5 or 6 per room). After work they return to the same dorm, eat in the same dining hall, and often socialize among themselves. Not surprisingly, all of the time that they spend together adds to their shared backgrounds in creating strong bonds among rural weavers.

Panels B and C of Table 1 show that the rural and urban weavers have similar distributions of performance measures and wage during our study period. Rural weavers, who constitute 67% of all weavers, have a higher mean defect rate, lower mean output, and lower mean wage than urban weavers. However, the magnitudes of the differences are small.

[12]None of the rural workers in our sample would meet the demanding eligibility criteria for an urban *hukou* as described above.

[13]On average, the urban weavers in our sample have been with SCT for over 13 years at the start of our sample period, whereas the rural weavers have been with the firm for fewer than six years.

2.3 Sources of coworker effects

SCT has six weaving rooms and uses a standard three-shift operation, so there are 18 departments defined by combinations of locations and shifts. Each weaver is assigned to one shift and one weaving room and does not change her shift or location for the duration of her employment. We define the coworkers of a weaver to be the other weavers that work in the same department, i.e. during the same shift in the same weaving room.

There is no team production within the Weaving Division of SCT. Each weaver is responsible for her own output while working alongside her coworkers, and the production technology itself generates no externality. On-the-job interactions among weavers are extremely rare because they wear masks and pay undivided attention to their looming machines, which also generate loud noise during production. As a result, "contemporaneous coworker effects", where a worker puts in more (or less) effort when her coworkers work harder, are unlikely to exist in our setting since weavers would not be able to observe their coworkers' productivity.

However, a weaver may still be influenced by her coworkers through "compositional coworker effects", where a weaver may perform better (or worse) when more able coworkers are merely present. Such compositional coworker effects could happen in our setting since workers are encouraged to outperform each other through formal and informal incentives, which we describe in the following section. Although a weaver does not change her department, the composition of workers in a given department changes from week to week due to employee turnover and temporary absence. The exogenous compositional changes at the department level allow us to identify the resulting coworker effects.

Table 2 summarizes the composition of weavers by department. A department has between 13 and 18 weavers but not all are present every week. The number of weavers working in a given shift and location can be as low as one during the holiday season and as high as 16 during the peak season, averaging about 10.5 across all departments and weeks. Importantly, every department has both rural and urban weavers. The proportion of rural weavers varies by department, but most departments consist of more rural migrants than urban residents.

Other demographic variables are not reported due to having little or no variation: all but nine weavers are female; they all have the same education level—middle school; and they are all Han Chinese, the main ethnic group in mainland China.

3 Competition in the Workplace

SCT fuels internal competition within each department (the primary organizational unit at the firm) through nurturing a competitive culture in general and adopting relative performance pay in particular. Each department holds mandatory weekly meetings, periodical training sessions, and skill contests after work, with the goal of enhancing weavers' problem-solving skills. Each year, the company selects "model workers" and provides them with recognition and prizes.[14] The departmental meetings, training sessions, skill contests, and selection of model workers clearly allow each weaver to observe her coworkers' abilities; they also generate both monetary and non-pecuniary incentives associated with status (Moldovanu et al., 2007; Blanes i Vidal and Nossol, 2011), motivating weavers to outperform her coworkers within the department.

More importantly, SCT uses relative performance incentives in addition to piece rates to determine the weekly wage of weavers.[15] According to the Director of Human Resources, each weaver's quality of output is the primary determinant of her wage, but her relative performance in her department during the week also matters. However, wage determination for weavers is based on an implicit understanding between labor and management at SCT, and we did not receive an explicit formula from SCT linking performance metrics to wages. Therefore, we use regressions to formally uncover the implicit wage determination mechanism. Our interviews with the upper management indicate that the wage scheme is uniform in the Weaving Division and there is no structural change in wage determination during the

[14]For example, about 40 model workers firm-wide were selected in 2002 and awarded with a trip to Singapore, Malaysia, and Thailand, staying in 3-star hotels. The firm did not disclose the identities of the model workers or the selection criteria.

[15]The use of relative performance pay is not a uncommon practice for textile firms. For instance, Kiyokawa (1991) documents its use in Japanese silk reeling firms.

period under study.

3.1 Econometric evidence on relative performance incentives

We estimate the following equation:

$$\begin{aligned}\log(wage_{it}) &= \beta\,(\text{own performance measures}_{it}) + \lambda\,(\text{relative performance measures}_{it}) \\ &+ \mu\,(\text{demand controls}_{it}) + \gamma\,(\text{worker fixed effects}_{i}) \\ &+ \theta\,(\text{aggregate and department specific time effects}) + \epsilon_{it}, \qquad (3)\end{aligned}$$

where the dependent variable is the average daily wage of worker i in week t, and the independent variables of interest include own performance measures (consisting of defect rate, daily non-defective output, and their quadratic terms) and relative performance measures (consisting of three dummies for the quartile of worker i's defect rate in her department in week t, with the bottom quartile being the omitted group). We include the quadratic terms of own performance measures to control for the potential nonlinearities in the wage scheme. We further include an extensive list of controls: we use planned defect rate, planned daily output, and size of worker i's department in week t to control for weekly demand; worker fixed effects account for any time-invariant pay differentials based on observed or unobserved worker characteristics, such as one's rural/urban status, or across departments; and week dummies and the interactions between month dummies and department dummies control for aggregate and department-specific time effects.[16]

Table 3 reports the OLS estimates of Equation (3). Column (1) of Table 3 reports the OLS estimates including only own performance measures and worker fixed effects. It confirms that quality control is extremely important at SCT: decreasing the defect rate by one standard deviation (0.18) increases daily wage by nearly 9 percent, and the relationship is highly significant. In contrast, increasing the quantity of output has no impact on wage,

[16] The only department-specific changes that our specifications do not account for are temporary weekly shocks within the same month.

indicating that weavers have no incentives to produce more than planned. Columns (2) and (3) subsequently add measures of relative performance and more controls. Both show that upon achieving the same quantity and quality of output, a worker receives extra pay when the quality of her output ranks better within the department.[17] Conditional on own performance measures, demand, worker fixed effects, and aggregate and department specific time effects, a weaver's wage will increase by 4.3 percent if she improves her relative performance in quality of output from the fourth to first quartile (column (3)). Likewise, an improvement in the quality of output from the fourth to second quartile and from the fourth to third quartile will increase a weaver's wage by 3.1 percent and 1.6 percent, respectively.

In column (4), we investigate whether the structure of wage determination varies by rural/urban social identity, since favoritism could be present not only in the base pay (which is controlled by worker fixed effects) but also in the piece rates and relative performance incentives. We add interaction terms of own and relative performance measures with an indicator variable for being rural and find the estimated coefficients to be small and statistically insignificant. Furthermore, the existing estimated coefficients of own and relative performance measures change little from column (3). Column (4) indicates that management does not have separate wage schemes for urban and rural weavers.

Column (5) provides additional evidence that the presence of relative performance incentives is robust to controlling for the nonlinear relationships between own performance measures and wage, using a more flexible specification than quadratic functional forms. We use seven dummies for defect rate and seven dummies for daily output to control for own performance. The coefficient estimates of relative performance measures become slightly smaller but remain economically meaningful and highly significant.

Finally, Table 3 indicates that a weaver's weekly wage does not depend on the size of her department in that week. In other words, it is not the case that each department has a fixed-size prize pool from which bonuses for relative performance are distributed.

[17] In unreported regressions we find that the relative performance in quantity of output has negligible impact on wage and does not affect the other coefficient estimates.

In unreported regressions we confirm the robustness of relative performance incentives to using alternative measures of relative performance.[18] Moreover, we verify that relative performance incentives only happen within a department, i.e., there are no incentives to outperform the workers in other departments.[19] Consistent with our field research, we also find no evidence that the wage schemes differ across locations or shifts.[20]

3.2 Implications on coworker effects

A large literature dating back to Lazear and Rosen (1981) has shown that relative performance pay not only has a direct impact on worker performance, it also influences the dynamics of worker interaction. In this study, we are particularly interested in understanding how the average coworker effects differ for in-group and out-group coworkers when relative performance incentives and social identities are present. Intuitively, internal competition encourages a worker to outperform her coworkers; strong social identities would likely mitigate the incentives to compete against in-group members while exacerbate the incentives to compete against out-group members. Therefore, we expect that on average, working with more able out-group coworkers would encourage a weaver to perform better, while the direction of the effect of working with more able in-group coworkers is less clear. If altruism toward in-group members overcomes self-interest to a large extent, weavers may even withhold effort for her in-group coworkers, resulting in negative coworker effects.

The magnitude and direction of coworker effects also depend on the structure of relative performance pay and the distribution of worker ability. For instance, Brown (2011) shows that in a "winner-take-all" setting (professional golf tournaments), the presence of a superstar

[18] We use two alternative ways to measure relative performance: (i) the weaver's numerical ranking within her department in a given week; and (ii) a dummy variable indicating whether the weaver outperforms the departmental average. Both types of measures yield significant coefficient estimates.

[19] We construct two dummy variables indicating whether a worker outperforms the other workers not in her department but in the same shift or location (one for the same shift and one for the same location). Both coefficient estimates are small and insignificant.

[20] Similar to column (4), we add to the specification in column (3) interaction terms of own and relative performance measures with an indicator variable for a particular shift or location. All of the estimated coefficients are small and insignificant.

player (Tiger Woods) has a negative effect on other participants' performances, and the effect is worse for higher-ranked players. However, unlike the professional golf tournaments examined in Brown (2011), in our setting the relative performance incentives are not skewed toward top finishers; the bonus for moving up into the next best quartile (or the loss for moving down) is similar across the performance distribution (between 1.2 and 1.6 percent of wage). Thus even weavers with relatively low abilities have incentives to put effort into outperforming their coworkers.[21] It is conceivable that two weavers on different ends of the ability distribution (i.e., a very high ability worker and a very low ability worker) may not be affected by the presence of each other. But uncovering the heterogeneity in coworker effects under different distributions of ability pairing is outside of the scope of this study, as our key contribution lies in identifying the differential competitive responses toward in-group and out-group coworkers.

4 Estimating Coworker Effects

4.1 Predicting permanent productivity and verifying random assignment

As a first step, we predict the time-invariant productivity (ability) of each individual weaver using a specification with an extensive list of covariates:

$$DefRate_{it} = D_i + \delta\left(DayOut_{it}, DaysWorked_{it}\right) + \mu C_{jt} + \zeta M_{it} + \epsilon_{it} \tag{4}$$

where D_i is the set of dummies capturing worker fixed effects, C_{jt} is the set of week dummies interacted with department dummies, and M_{it} is a set of 287 coworker dummy variables controlling for the presence of coworkers. For instance, the dummy variable "coworker1" in week t takes a value of 1 if worker 1 is a coworker to the focal worker i with $i \neq 1$ in week

[21]In addition, the rising ability of coworkers may intensify a low ability weaver's fear of job loss and motivate her to work harder.

t.[22] We include daily non-defective output and days worked in a week so that we capture each weaver's ability to maintain a high quality of output, holding the quantity of output and length of work time constant. We do not include the planned performance measures because we are not measuring a weaver's ability to outperform the plan.

Each weaver's predicted ability is her estimated worker fixed effect from fitting Equation (4). Figure 1 shows that there is substantial variation in the predicted permanent productivity across all weavers. Moreover, urban weavers are more likely to concentrate in the middle of the distribution, whereas rural weavers are more likely to be in the tails. However, a two-sample t test does not reject the null hypothesis that the urban and rural workers' distributions have equal means ($t = 0.15$).

If the assignment of coworkers were non-random, then it is possible that unobserved factors other than exogenous compositional changes would drive the estimated coworker effects. Our field research at SCT points to the absence of any explicit or implicit rules of assigning weavers, and we provide two sets of econometric evidence supporting this claim. First, we test whether a high-ability weaver is more likely to work with other high-ability weavers at the same time. To do so, we employ the bias-correction method of Guryan et al. (2009) and estimate the following regression:

$$\widehat{ability}_i = \alpha + \beta\overline{\widehat{ability}_{-i,jt}} + \gamma\overline{\widehat{ability}_{-i,j}} + \mu D_j + \epsilon_{it} \tag{5}$$

where $\widehat{ability}_i$ is the predicted permanent productivity of the focal weaver i, $\overline{\widehat{ability}_{-i,jt}}$ is the average predicted permanent productivity of weaver i's coworkers in week t, and $\overline{\widehat{ability}_{-i,j}}$ is the average predicted permanent productivity of all of weaver i's possible coworkers, i.e. anyone who has ever worked in her department during the study period. Since workers do not change departments, their predicted permanent productivities also include potential

[22] With fewer than 10,000 observations, we do not have the statistical power to control for all of the possible compositions of coworkers, i.e., all of the combinations of dummies in M_{it} that are realized in a department. Doing so would require estimating over 5,500 dummies in addition to the existing covariates. We assume that the combination of C_{jt} and M_{it} sufficiently purges the coworker effects. In the appendix we show that our key results are robust to using alternative measures of ability.

department fixed effects. We thus control for the set of department dummies (D_j). Since the key independent variables (predicted abilities) are predicted from other regressions, we bootstrap the standard errors with 2000 repetitions and cluster them at the individual level.

The coefficient β in Equation (5) indicates whether more able weavers are matched with other more able coworkers at time t. Since a weaver cannot be her own coworker, her coworkers are drawn from an otherwise identical pool excluding the focal worker. Thus, the average ability of the pool that her coworkers are drawn from in each week has an inverse relationship with the focal worker's ability. Without controlling for $\overline{\widehat{ability}_{-i,j}}$, the estimated β has a downward bias, and the bias is more severe for smaller pools (Guryan et al., 2009). By construction, $ability_i = N\overline{\widehat{ability}_j} - (N-1)\overline{\widehat{ability}_{-i,j}}$ where $\overline{\widehat{ability}_j}$ is the average ability of everyone ever present in worker i's department and N is the total number of these workers. Since D_j, the set of department dummies, fully absorbs $N\overline{\widehat{ability}_j}$, γ should be close to the mean of $-(N-1)$ across all departments, which is around -15 in our data.

Panel A of Table 4 confirms the lack of systematic assignment with respect to ability levels. Columns (A1) and (A2) use the bias-correction specifications that include $\overline{\widehat{ability}_{-i,j}}$.[23] Compared to column (A1), the specification in column (A2) adds week dummies as an additional set of controls. In both columns, the coefficient estimates of β are close to zero and insignificant, indicating that more able weavers are not systemically assigned to work together. As expected, the estimated γ is close to -15 and significant at the 1 percent level. Columns (A3) and (A4) show that not controlling for $\overline{\widehat{ability}_{-i,j}}$ introduces a negative bias to the coefficient estimates of β.

Second, we use the following first difference model to show that the composition of workers is not driven by aggregate demand:

$$\triangle(\text{Planned performance measure})_{it} = \beta\triangle\overline{\widehat{ability}_{-i,jt}} + \theta\triangle n_{jt} + \gamma\,(\text{time effects}) + \epsilon_{it} \quad (6)$$

[23]The number of observations in Panel A is smaller than in Table 3 because there are five observations where only one worker worked in the department that week (hence having no coworkers), which happened during the week of the Chinese New Year.

where the dependent variable is either planned defect rate or planned daily output, $\overline{\widehat{ability}_{-i,jt}}$ is the same as above, and n_{jt} is the number of coworkers in department j in week t. We also estimate the equation with and without week dummies.

Panel B in Table 4 shows that there are no correlations between the average permanent productivity of coworkers and the planned quantity or quality of the focal weaver's output.[24] In other words, it is not the case that, for instance, more able coworkers are present when the weaver is facing challenging production plans.

Table A.1 in the appendix provides additional evidence on random assignment. We estimate Equations (5) and (6) but substitute average coworker ability ($\overline{\widehat{ability}_{-i,jt}}$) with average in-group coworker ability ($\overline{\widehat{ability}_{-i,gjt}}$, where g denotes a group) and average out-group coworker ability ($\overline{\widehat{ability}_{-g,jt}}$). Similar to Table 4, the coefficient estimates of average in-group and out-group coworker abilities are all small and insignificant when controlling for $\overline{\widehat{ability}_{-i,j}}$. Taken together, the results in this section support our field observation that there are no systematic rules of assigning weavers in SCT based on ability levels.

4.2 Regression results on coworker effects by social identity

Having established the random assignment of coworkers, we are now ready to specify our first-difference models:

$$\triangle DefRate_{it} = \alpha_0 \triangle \overline{\widehat{ability}_{-i,jt}} + \delta\,(\text{controls}) + \epsilon_{it} \qquad (7)$$

$$\triangle DefRate_{it} = \beta_0 \triangle \overline{\widehat{ability}_{-i,gjt}} + \beta_1 \triangle \overline{\widehat{ability}_{-g,jt}} + \delta\,(\text{controls}) + \epsilon_{it} \qquad (8)$$

where i denotes a weaver, t denotes a week, j denotes a department, and g denotes a group (rural or urban); $\overline{\widehat{ability}_{-i,jt}}$ is the average ability of worker i's coworkers, $\overline{\widehat{ability}_{-i,gjt}}$ is the average ability of worker i's in-group coworkers, and $\overline{ability_{-g,jt}}$ is the average ability

[24]The number of observations in Panel B decreases from Panel A, since by using first-difference models we exclude observations where performance measures in the prior week are missing (e.g., a worker's first observed week or when she is absent in the prior week).

of worker i's out-group coworkers. Controls include the first differences in the number of coworkers (Equation (7)) or the numbers of in-group and out-group coworkers (Equation (8)), daily non-defective output, days worked in week t, and week dummies.

Table 5 presents the OLS estimates of Equations (7) and (8) with bootstrapped standard errors.[25] Columns (1) and (2) of Table 5 provide weak evidence that a weaver performs better when higher-ability coworkers are present, but the estimated coefficient of average coworker ability is not statistically significant when week dummies are included (colunn (2)). Columns (3) and (4) show that coworkers only compete against their *out-group* coworkers but not against in-group coworkers: in both columns, the estimated β_0 is small and insignificant, whereas the estimated β_1 is large, positive, and significant. The magnitude of the out-group coworker effect is economically meaningful: conditional on the full set of controls, a one-standard-deviation improvement in the average predicted ability of a weaver's out-group coworkers would decrease her own defect rate by around 0.033 percentage points (column (4)), which would raise her daily wage by around 1.5 percent (column (1) of Table 3). Table 5 also shows that the focal weaver's productivity does not depend on the size of her department or the sizes of the rural and urban groups during the week

In Table 6, we examine whether social identity affects rural and urban weavers differently. We do so by adding two variables to Equation (8) that interact being a rural weaver with the average ability of her in-group coworkers ($\overline{ability_{-i,gjt}}$) or the average ability of her out-group coworkers ($\overline{\widehat{ability}_{-g,jt}}$). Column (1) shows that urban resident weavers are highly responsive to changes in the average ability of their rural coworkers, whereas the opposite effect from urban coworkers to rural weavers is significantly weaker. Column (1) also suggests that rural weavers on average reduce their productivity when more able rural coworkers are present, but the effect is not significant. The conservative interpretation is that both rural and urban groups are not significantly responsive to changes in the average ability of their in-group coworkers. Since most of the departments have more rural weavers than urban weavers, in

[25] The number of observations drops slightly when we estimate Equation (8), compared to Equation (7), since in rare cases there are no in-group (or out-group) coworkers.

column (2) we repeat the analysis for the fifteen departments that have a majority of rural weavers. The coefficient estimates on the first difference in average out-group coworker ability and its interaction term with being a rural weaver become larger and more significant. In other words, urban workers become even more sensitive to rural coworkers' changing ability levels in the departments dominated by rural weavers.

We provide a few robustness checks in the appendix. First, since all but nine weavers are female, we show that our key findings are robust to restricting the sample of workers and coworkers to female (Table A.2). Next, we confirm that our results are robust to excluding the less experienced workers or temporary workers (Table A.3).[26] Finally, instead of average coworker abilities, we use the proportions of "above-median" in-group and out-group coworkers as the key right-hand side variables, which are more coarse but less susceptible to measurement errors in the predicted abilities.[27] The estimates are noisier but yield the same qualitative findings (Table A.4).

4.3 Discussion

Overall, we find that social identity migitates competition among in-group members and intensities intergroup competition. We also find asymmetric effects of rural and urban social identity, where urban weavers are particularly competitive against rural coworkers but not vice versa. In this section we discuss a few potential explanations for our findings.

First, identity-induced intergroup competitiveness may be stronger for urban weavers. The rising average ability of their out-group coworkers (rural weavers) would potentially post a threat to an urban weaver's feeling of supremacy, both for being an original resident of the urban city as well as for having more experience with the firm. The rising average ability of rural weavers means that what is the norm in the first place, i.e., the urban resident community outperforming the rural migrant community, has the potential to be overturned.

[26] We do so by restricting the sample to those who have worked for SCT for more than five years at the beginning of the study period or to those who have worked for more than 33 weeks during the study period.

[27] A worker is "above-median" if her predicted ability is above the median of all workers from her department.

In contrast, such a sense of supremacy over outsiders is absent among the rural weavers, who are the newcomers to the city and the firm. The rising average ability of their out-group coworkers (urban weavers) does not present an existential threat to the rural migrant worker community. Rather, what is the norm in the first place will now become even more likely.

[Second, statistically, there is more variation in rural coworkers' ability level than in urban workers' abilities.]

Third, a priori it is unclear whether the rural workers in our sample have stronger or weaker social identity than the rural population. If it is indeed the case that migrants are more individualistic and less group-oriented than the rural population, the selection may account for the lack of significant group identity effect for rural worker behavior.

[Reconcile with Afridi et al. (2015)]

[Reconcilde with Dato and Nieken (2014) *These findings are consistent with Dato and Nieken (2014), which compares male and female subjects and reports that male subjects tend to hold a belief that men perform better than women in the tournament. They find that male subjects increase their performance when their tournament opponents are revealed to be female but female subjects do not change their performance when their tournament opponents are revealed to be male. Since gender is also an important aspect of social identity, both their study and ours consistently show intergroup competition is more relevant to the group that holds a belief of supremacy over the other group (men in their case, and urban workers in ours) while less so to the other group (women and rural workers). Dato and Nieken (2014) show that if the gender of the opponent is revealed before a two-player tournament begins, male subjects increase their performance, especially when the revealed opponent's gender is female. Dato and Nieken (2014) find that if the gender of the opponent is revealed before the start of a two-person tournament, male subjects increase their performance, especially when the revealed opponent's gender is female. To the extent to which gender can be interpreted as social identity, their overall conclusion that men respond to female opponents more strongly than to male opponents is consistent with our key findings, despite the obvious methodological* *difference between their lab experimental study and our study.*]

Our results suggest that the positive incentive effect of relative performance will be greater in an integrated workplace (where different social identities coexist in the same workplace) than in a segregated workplace (where all workers in the same workplace sharing the same social identity). More specifically, the management at SCT can maximize competition by matching high ability rural migrant workers with urban resident workers, and a new hire who is a high ability rural worker should be assigned to a department with many urban workers. In our setting, integrated workplace has productivity advantage over segregated workplace due to the presence of intense intergroup competition. In the absence of such intergroup competition, the productivity advantage of the integrated workplace may not appear. As such, the integrated workplace is not always productivity-enhancing.[28] Management ought to pay particular attention to the nature of production and incentives when deliberating on the formation of the integrated workplace.

5 Conclusion

In this paper we examine what happens when competition meets social identity in a real economic setting. We have taken advantage of an unusual opportunity to study a Chinese textile firm in which relative performance incentives are put in place to encourage competition in the workplace, and in which there is a natural division of all weavers into two distinct groups: urban resident and rural migrant workers. We have found that urban weavers compete against their rural coworkers but not against urban coworkers. We have found no evidence that rural weavers compete against either group of coworkers.

We provide a new and important insight that management interested in inducing competition at workplace ought to pay particular attention to social identity in the workplace. In the presence of social identities, competition will bring about rather complex group dynam-

[28]One example would be the Kenyan flower production plant in Hjort (2014), where the integrated workplace suffer an efficiency loss resulting from misallocation of resources instead.

ics. By taking advantage of such dynamics, management can design and implement relative performance schemes that maximize the beneficial aspects of competition and minimizes its "dark side" such as sabotage. For instance, competition-induced sabotage would be particularly counter-productive when workers have complementary skills. Our study suggests that managers could still take advantage of relative performance incentives if workers with complementary skills belong to the same social groups. Furthermore, with social identity in place, management needs to think carefully about hiring and firing decisions, as changes in the composition of workers could influence the interplay of social identity and relative performance incentives.

We acknowledge that this paper studies the case of a Chinese textile firm, and hence our findings and their implications ought to be interpreted as such. Assessing the external validity of our findings using data from firms in other industries and other countries is left for future work.

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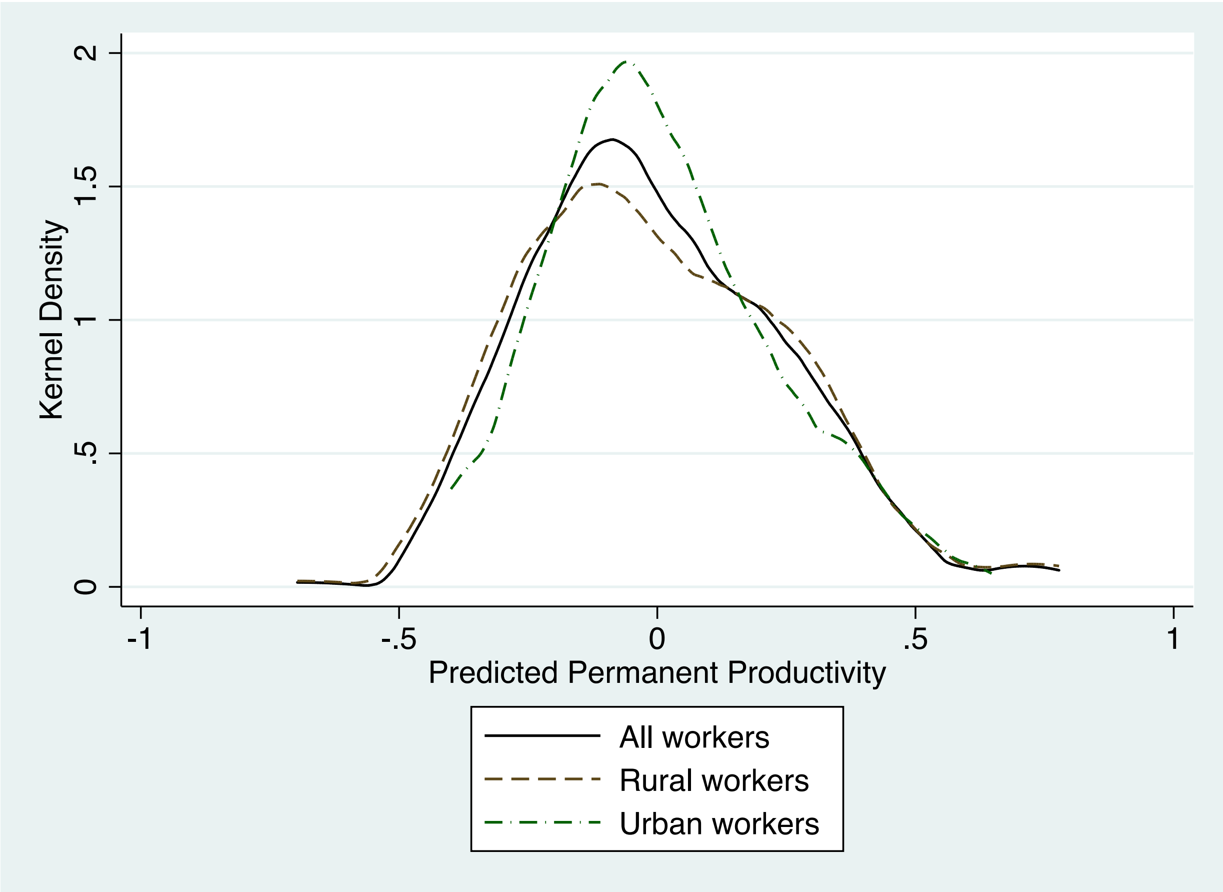
Tables and Figures

Figure 1: Kernel Density Plot of Predicted Permanent Productivity



Notes: This figure plots the kernel density of the workers' predicted permanent productivity. Predicted permanent productivity is the estimated worker fixed effect from fitting Equation (4).

Table 1: Summary Statistics of Performance Measures and Wage

Panel A: Sample = All Workers (N = 9,966)

	Mean	Std. Dev.	Min.	Max.
Defect rate ($DefRate$)	0.239	0.181	0.007	2.497
Planned defect rate	7.942	2.906	0	22
Daily output ($DayOut$)	54.555	18.285	5.908	192.361
Planned daily output	51.246	17.531	6.453	227.187
Work days	6.271	0.880	2	7.8
Daily wage	23.569	3.337	11.782	32.202

Panel B: Sample = Rural Workers (N = 6,239)

	Mean	Std. Dev.	Min.	Max.
Defect rate ($DefRate$)	0.245	0.177	0.007	2.497
Planned defect rate	7.948	2.830	0	22
Daily output ($DayOut$)	54.248	18.817	7.334	192.361
Planned daily output	50.998	18.059	7.637	202.048
Work days	6.232	0.912	2	7.75
Daily wage	23.325	3.430	11.782	32.202

Panel C: Sample = Urban Workers (N = 3,727)

	Mean	Std. Dev.	Min.	Max.
Defect rate ($DefRate$)	0.230	0.187	0.010	2.270
Planned defect rate	7.933	3.030	2	22
Daily output ($DayOut$)	55.068	17.347	5.908	186.228
Planned daily output	51.661	16.602	6.453	227.187
Work days	6.336	0.821	2	7.8
Daily wage	23.978	3.135	14.579	31.431

Notes: Worker×week-level observations. *Defect rate* is measured in percent and equals defective output multiplied by one hundred divided by total output. *Daily output* is measured in ten meters and equals non-defective output divided by ten times the number of days worked. *Daily wage* equals weekly wage divided by the number of days worked. Each work day is equivalent to an eight-hour shift.

Table 2: Composition of Weavers by Shift and Location

Location	Shift	Num. Workers in a Week			Number of Workers	Share of Workers	
		Min	Max	Mean	Ever Present	Female	Rural
1	1	3	13	10.75	15	100.0%	26.7%
1	2	3	15	10.74	18	100.0%	77.8%
1	3	1	15	9.66	16	100.0%	81.3%
2	1	2	11	8.42	16	87.5%	31.3%
2	2	2	13	9.25	17	100.0%	76.5%
2	3	2	15	12.43	18	100.0%	66.7%
3	1	1	12	9.47	14	92.9%	42.9%
3	2	4	15	10.91	18	94.4%	72.2%
3	3	2	14	11.11	16	100.0%	62.5%
4	1	2	12	9.43	15	93.3%	60%
4	2	1	15	9.79	16	100.0%	68.8%
4	3	3	15	12.21	16	100.0%	81.3%
5	1	1	15	11.30	16	87.5%	75%
5	2	3	14	8.64	16	100.0%	87.5%
5	3	3	16	12.92	16	87.5%	62.5%
6	1	3	14	11.02	15	100.0%	66.7%
6	2	3	12	8.74	13	100.0%	92.3%
6	3	4	16	11.43	16	100.0%	62.5%
Total					287	96.9%	66.6%

Notes: Number of workers in a week is the total number of weavers who worked in the combination of shift and location during a given week. *Number of workers ever present* is the total number of weavers who ever worked in the combination of shift and location during our sample period (April 2003–March 2004).

Table 3: Performance and Wage. Dependent Variable = Log of Daily Wage

	(1)	(2)	(3)	(4)	(5)
Defect rate	-0.448***	-0.387***	-0.282***	-0.273***	
	(0.027)	(0.037)	(0.033)	(0.052)	
Defect rate squared	0.228***	0.199***	0.150***	0.158***	
	(0.021)	(0.024)	(0.021)	(0.038)	
Daily output	-0.000	-0.000	-0.000	-0.000	
	(0.000)	(0.000)	(0.001)	(0.001)	
Daily output squared	0.000	0.000	-0.000	-0.000	
	(0.000)	(0.000)	(0.000)	(0.000)	
Defect rate in top quartile		0.020**	0.043***	0.039***	0.034***
		(0.008)	(0.007)	(0.012)	(0.007)
Defect rate in second quartile		0.014**	0.031***	0.030***	0.022***
		(0.006)	(0.005)	(0.009)	(0.005)
Defect rate in third quartile		0.006	0.016***	0.018***	0.012***
		(0.005)	(0.005)	(0.007)	(0.005)
Interaction terms: Rural ×					
Defect rate				-0.016	
				(0.064)	
Defect rate squared				-0.013	
				(0.044)	
Defect rate in top quartile				0.006	
				(0.015)	
Defect rate in second quartile				0.001	
				(0.011)	
Defect rate in third quartile				-0.003	
				(0.009)	
Number of workers			-0.001	-0.001	-0.001
			(0.001)	(0.001)	(0.001)
Additional controls			Y	Y	Y
Performance dummies					Y
Adjusted R^2	0.434	0.435	0.494	0.494	0.494
N	9,966	9,966	9,966	9,966	9,966

Notes: Worker×week-level observations. Coefficients reported are from OLS regressions with worker fixed effects. Robust standard errors clustered at the individual level are shown in parentheses. * $p < 0.10$ ** $p < 0.05$ *** $p < 0.01$. *Defect rate* is measured in percent and equals defective output multiplied by one hundred divided by total output. *Daily output* is measured in 10 meters and equals non-defective output divided by the number of days worked. *Defect rate quartile* is calculated within department and week. *Additional controls* include planned defect rate, planned daily output, dummies for week, and dummies for month*department. *Performance dummies* include seven dummies for defect rate (0–0.05, 0.05–0.1, 0.1–0.15, 0.15-0.2, 0.2–0.25, 0.25–0.3, 0.3–0.4) and seven dummies for daily output (0–20, 20–30, 30–40, 40–50, 50–60, 60–70, 70–80). All regressions include dummies for individual worker.

Table 4: Random Assignment Tests

Panel A: Dep. Var. = Focal Worker's Predicted Permanent Productivity ($\widehat{ability}_i$)

	(A1)	(A2)	(A3)	(A4)
Average coworker permanent productivity	0.002	-0.002	-2.673***	-2.889***
($\overline{\widehat{ability}}_{-i,jt}$)	(0.011)	(0.011)	(0.310)	(0.323)
Leave-me-out average of the pool	-14.933***	-14.928***		
($\overline{\widehat{ability}}_{-i,j}$)	(0.131)	(0.132)		
Week dummies		Y		Y
Department dummies	Y	Y	Y	Y
Adjusted R^2	0.998	0.998	0.790	0.795
N	9,961	9,961	9,961	9,961

Panel B: Dep. Var. = △Focal Worker's Production Plan

	△Planned Defect Rate		△Planned Daily Output	
	(B1)	(B2)	(B3)	(B4)
△Average coworker permanent productivity	-0.374	-0.139	-5.813	7.221
($\triangle\overline{\widehat{ability}}_{-i,jt}$)	(0.831)	(0.873)	(11.752)	(10.714)
△Number of workers	-0.007	-0.036*	0.291**	0.272
	(0.014)	(0.020)	(0.132)	(0.179)
Week dummies		Y		Y
Adjusted R^2	-0.000	0.040	0.001	0.071
N	9,009	9,009	9,009	9,009

Notes: Worker×week-level observations. Coefficients reported are from OLS regressions. Standard errors shown in parentheses are bootstrapped with 2000 repetitions and clustered at the individual level. * $p < 0.10$ ** $p < 0.05$ *** $p < 0.01$. Permanent productivity is the estimated worker fixed effect from fitting Equation (4). *Average coworker permanent productivity* is the average permanent productivity of all workers that work with focal worker i in the same department in week t. *Leave-me-out average of the pool* is the average permanent productivity of all workers ever present in focal worker i's department. The calculation of averages excludes the focal worker.△ indicates the use of first difference.

Table 5: Coworker Effects and Group Identity. Dependent Variable = △Focal Worker's Defect Rate.

	(1)	(2)	(3)	(4)
△Average coworker permanent productivity	0.402*	0.293		
$(\triangle \overline{\widehat{ability}}_{-i,jt})$	(0.206)	(0.208)		
△Number of workers	-0.003	-0.002		
	(0.002)	(0.002)		
△Average in-group coworker permanent productivity			-0.005	-0.070
$(\triangle \overline{\widehat{ability}}_{-i,gjt})$			(0.154)	(0.145)
△Average out-group coworker permanent productivity			0.230**	0.166*
$(\triangle \overline{\widehat{ability}}_{-g,jt})$			(0.114)	(0.099)
△Number of in-group workers			-0.002	-0.001
			(0.002)	(0.002)
△Number of out-group workers			-0.003	-0.003
			(0.004)	(0.003)
Week dummies		Y		Y
Adjusted R^2	0.122	0.146	0.114	0.140
N	9,009	9,009	8,823	8,823

Notes: Worker×week-level observations. Coefficients reported are from OLS regressions. Standard errors shown in parentheses are bootstrapped with 2000 repetitions and clustered at the individual level. * $p < 0.10$ ** $p < 0.05$ *** $p < 0.01$. All regressions include focal worker's daily non-defective output and days worked in a week. *Average coworker permanent productivity* is the average permanent productivity of all workers that work with focal worker i in the same department in week t, where permanent productivity is the estimated worker fixed effect from fitting Equation (4). *Average in-group coworker permanent productivity* is the average permanent productivity of all workers that work with focal worker i in the same department in week t and share the same rural/urban status. *Average out-group coworker permanent productivity* is the average permanent productivity of all workers that work with focal worker i in the same department in week $t$and do not share the same rural/urban status. The calculation of averages excludes the focal worker. △ indicates the use of first difference.

Table 6: Heterogeneous Coworker Effects and Group Identity. Dependent Variable = $\triangle$Focal Worker's Defect Rate.

	(1)	(2)
$\triangle$Average in-group coworker permanent productivity	-0.218	-0.273
$(\triangle\overline{\widehat{ability}}_{-i,gjt})$	(0.263)	(0.283)
Rural $\times$ $\triangle$Average in-group coworker permanent productivity	0.314	0.427
	(0.294)	(0.311)
$\triangle$Average out-group coworker permanent productivity	0.601*	0.818**
$(\triangle\overline{\widehat{ability}}_{-g,jt})$	(0.309)	(0.398)
Rural $\times$ $\triangle$Average out-group coworker permanent productivity	-0.558*	-0.777*
	(0.330)	(0.414)
Adjusted R^2	0.141	0.147
Sample	All Departments	Dept. with $\geq$ 60% Rural Workers
N	8,823	7,450

Notes: Worker$\times$week-level observations. Coefficients reported are from OLS regressions. Standard errors shown in parentheses are bootstrapped with 2000 repetitions and clustered at the individual level. * $p < 0.10$ ** $p < 0.05$ *** $p < 0.01$. In column (1), the sample consists of workers from all departments. In column (2), the sample consists of workers from fifteen departments that have more rural workers than urban workers (see Table 2 for the composition of workers by department). All regressions include focal worker's daily output, focal workers' days worked in a week, number of in-group coworkers, number of out-group coworkers, and dummies for week. *Average coworker permanent productivity* is the average permanent productivity of all workers that work with focal worker i in the same department in week t, where permanent productivity is the estimated worker fixed effect from fitting Equation (4). *Average in-group coworker permanent productivity* is the average permanent productivity of all workers that work with focal worker i in the same department in week t and share the same rural/urban status. *Average out-group coworker permanent productivity* is the average permanent productivity of all workers that work with focal worker i in the same department in week t and do not share the same rural/urban status. The calculation of averages excludes the focal worker. $\triangle$ indicates the use of first difference.

Appendix Tables

Table A.1: Additional Random Assignment Tests

Panel A: Dep. Var. = Focal Worker's Predicted Permanent Productivity ($\widehat{ability}_i$)

	(A1)	(A2)
Average in-group coworker permanent productivity	0.005	0.003
($\overline{\widehat{ability}}_{-i,gjt}$)	(0.009)	(0.009)
Average out-group coworker permanent productivity	-0.015	-0.018
($\overline{\widehat{ability}}_{-g,jt}$)	(0.013)	(0.013)
Leave-me-out average of the pool	-14.935***	-14.928***
($\overline{\widehat{ability}}_{-i,j}$)	(0.125)	(0.128)
Week dummies	No	Yes
Department dummies	Yes	Yes
Adjusted R^2	0.998	0.998
N	9824	9824

Panel B: Dep. Var. = △*FD in Focal Worker's Production Plan*

	△Planned Defect Rate	△Planned Daily Output
	(B1)	(B2)
△Average in-group coworker permanent productivity	-0.907	2.060
($\triangle\overline{\widehat{ability}}_{-i,gjt}$)	(0.886)	(7.679)
△Average out-group coworker permanent productivity	-0.137	2.315
($\triangle\overline{\widehat{ability}}_{-g,jt}$)	(0.859)	(7.673)
△Number of workers	-0.035*	0.211
	(0.021)	(0.182)
Week dummies	Yes	Yes
Adjusted R^2	-0.000	0.040
N	9,009	9,009

Notes: Worker×week-level observations. Coefficients reported are from OLS regressions. Standard errors shown in parentheses are bootstrapped with 2000 repetitions and clustered at the individual level. * $p < 0.10$ ** $p < 0.05$ *** $p < 0.01$. Permanent productivity is the estimated worker fixed effect from fitting Equation (4). *Average in-group coworker permanent productivity* is the average permanent productivity of all workers that work with focal worker i in the same department in week t and share the same rural/urban status. *Average out-group coworker permanent productivity* is the average permanent productivity of all workers that work with focal worker i in the same department in week $t$and do not share the same rural/urban status. *Leave-me-out average of the pool* is the average permanent productivity of all workers ever present in focal worker i's department. The calculation of averages excludes the focal worker. △ indicates the use of first difference.

Table A.2: Coworker Effects and Group Identity among Female Workers. Dependent Variable = △Focal Worker's Defect Rate.

	(1)	(2)	(3)	(4)
△Average female coworker permanent productivity	0.292			
	(0.201)			
△Average in-group female coworker permanent productivity		-0.053	-0.239	-0.300
		(0.144)	(0.287)	(0.292)
△Average out-group female coworker permanent productivity		0.159	0.505*	0.767**
		(0.097)	(0.291)	(0.386)
Rural × △Average in-group female coworker permanent productivity			0.359	0.460
			(0.316)	(0.328)
Rural × △Average out-group female coworker permanent productivity			-0.456	-0.719*
			(0.317)	(0.403)
Adjusted R^2	0.148	0.141	0.142	0.149
Sample	Female Weavers			Female & $\geq$ 60% Rural Dept.
N	8,717	8,507	8,507	7,208

Notes: Worker×week-level observations. Coefficients reported are from OLS regressions. Standard errors shown in parentheses are bootstrapped with 2000 repetitions and clustered at the individual level. * $p < 0.10$ ** $p < 0.05$ *** $p < 0.01$. All regressions include focal worker's daily non-defective output, days worked in a week, and dummies for week. Column (1) also controls for number of workers in the department; columns (2) to (4) control for number of in-group coworkers and number of out-group coworkers. In columns (1) to (3), the sample consists of all female workers. In column (4), the sample consists of female workers in fifteen departments that have more rural workers than urban workers (see Table 2 for the composition of workers by department). *Average female coworker permanent productivity* is the average permanent productivity of all female workers that work with focal worker i in the same department in week t, where permanent productivity is the estimated worker fixed effect from fitting Equation (4). *Average in-group female coworker permanent productivity* is the average permanent productivity of all female workers that work with focal worker i in the same department in week t and share the same rural/urban status. *Average out-group female coworker permanent productivity* is the average permanent productivity of all female workers that work with focal worker i in the same department in week $t$and do not share the same rural/urban status. The calculation of averages excludes the focal worker. △ indicates the use of first difference.

Table A.3: Robustness Checks with Different Subsamples. Dependent Variable = △Focal Worker's Defect Rate.

	(1)	(2)	(3)	(4)
△Average in-group coworker permanent productivity	-0.097	-0.166	-0.109	-0.233
	(0.181)	(0.221)	(0.151)	(0.262)
△Average out-group coworker permanent productivity	0.325*	0.552**	0.181*	0.656**
	(0.173)	(0.275)	(0.108)	(0.326)
Rural × △Average in-group coworker permanent productivity		0.371		0.292
		(0.330)		(0.297)
Rural × △Average out-group coworker permanent productivity		-0.493		-0.619*
		(0.364)		(0.350)
Adj.R-squared	0.164	0.165	0.143	0.145
Sample	Tenure > 5 years		Worked > 33 weeks	
N	4,371	4,371	7,340	7,340

Notes: Worker×week-level observations. Coefficients reported are from OLS regressions. Standard errors shown in parentheses are bootstrapped with 2000 repetitions and clustered at the individual level. * $p < 0.10$ ** $p < 0.05$ *** $p < 0.01$. . All regressions include focal worker's daily output, focal workers' days worked in a week, number of in-group workers, number of out-group workers, and week dummies. In columns (1) and (2), the sample consists of workers that have been with SCT for more than five years at the beginning of the sample period. In columns (3) and (4), the sample consists of workers that worked more than 33 weeks during the sample period. *Average in-group coworker permanent productivity* is the average permanent productivity of all workers that work with focal worker i in the same department in week t and share the same rural/urban status. *Average out-group coworker permanent productivity* is the average permanent productivity of all workers that work with focal worker i in the same department in week $t$and do not share the same rural/urban status. The calculation of averages excludes the focal worker. △ indicates the use of first difference.

Table A.4: Robustness Checks with Alternative Measures of Coworker Ability. Dependent Variable = △Focal Worker's Defect Rate.

	(1)	(2)	(3)	(4)
△Proportion of in-group "above-median" coworkers	-0.019	-0.002	0.005	0.015
	(0.027)	(0.027)	(0.046)	(0.044)
△Proportion of out-group "above-median" coworkers	-0.049*	-0.041	-0.102	-0.082
	(0.030)	(0.028)	(0.077)	(0.073)
Rural × △Proportion of in-group "above-median" coworkers			-0..048	-0.035
			(0.052)	(0.052)
Rural × △Proportion of out-group "above-median" coworkers			0.075	0.056
			(0.081)	(0.077)
Week dummies	No	Yes	No	Yes
Adj.R-squared	0.114	0.140	0.114	0.140
N	8,823	8,823	8,823	8,823

Notes: Worker×week-level observations. Coefficients reported are from OLS regressions. Standard errors shown in parentheses are robust and clustered at the individual level. * $p < 0.10$ ** $p < 0.05$ *** $p < 0.01$. . All regressions include focal worker's daily output, focal workers' days worked in a week, number of in-group workers, and number of out-group workers. *"Above-median"* is an indicator that equals one if the worker's permanent productivity is better than the median permanent productivity of her department. *Proportion of in-group (out-group) "above-median" coworkers* in a week is calculated as the number of in-group (out-group) "above-median" coworkers divided by the number of in-group (out-group) coworkers working that week. △ indicates the use of first difference.