Unionization and Incentives: Evidence from the Field

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Abstract: This paper investigates the impact of unionization on two farms in Ethiopia with different incentive schemes. Under relative incentives, where worker effort imposes a negative externality on co-workers, the average union member's productivity is 10 percent lower at the intensive margin than the average non-union member's. Under piece rates, where worker effort imposes no externality, the union has no effect at the intensive margin. I argue the result under relative incentives is due to union workers internalizing the externality more than non-union workers. This is especially apparent when there are more union members in a working group on a given day, which rules out pure altruism as the driving force of worker behavior. Further, I find that group output variance is lower for higher levels of union member concentration, which suggests collusion.

Keywords: Development Economics; Social Preferences; Incentive Schemes.

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1 Introduction

This paper analyzes the effect of unionization on individual productivity under two different incentive schemes using personnel data from two farms in Ethiopia. I find that when the incentive scheme is such that worker effort imposes a negative externality on co-workers, the average union member's productivity 10 percent lower at the intensive margin than the average non-union member's. When the incentive scheme is such that there are no externalities to effort, there is no significant difference at the intensive margin. I contend that is the interaction of reduced form social preferences[1] and the incentive scheme that best describes these results. Since preferences of this type are often ignored, both practically and academically, the issues discussed here are of great importance. As I show, worker behavior depends greatly on how and to what extent preferences interact with incentives and social networks.

The two farms analyzed in this paper provided productivity data at the worker-day level in exchange for analysis. On Farm 1, which uses relative incentives, a worker's daily pay depends on her performance relative to the average of her co-workers. Hence, taking others' effort as given, working harder imposes a negative externality (in the form of lower wages) on co-workers. In contrast, Farm 2 employs piece rate compensation, so a worker's pay is a predetermined constant set by management multiplied by productivity during the day; here, there are no wage externalities associated with effort.

Certain features of these farms facilitate the analysis. First, the same workers are observed before and after union introduction, so panel data techniques allow me to obtain a differences-in-differences estimation of the effect of unionization, controlling for other observable determinants of productivity. Second, the union was introduced orthogonally to productivity on both farms while other enivornmental characteristics were stable, allowing me to isolate the effect of the union. Third, workers are called upon to work (or not) daily,

[1] By reduced form social preferences, I mean behavior consistent with models of pure altruism, reciprocity, or collusion.

so the composition of a worker's group varies over time.

Since Farm 1 (relative incentives) affords more ways to distinguish between types of social preferences, the empirics are more involved. First, I run a panel regression to obtain the effect of union membership on individual productivity, distinguishing between selection of workers for activity on a given day and selection of effort at the intensive margin. I then create a measure of ability and find that more able workers select into the union, indicating that the union depresses productivity internally. Next, I find that worker effort depends on the amount of union members in her group, so I rule out pure altruism as the driving force of the results. Finally, since variance of output at the group-day level is lower for groups with higher union concentration, I argue that collusion around a social norm best explains worker behavior.

In contrast, analysis of Farm 2 (piece rates) reveals no effect of the union at the intensive margin. I argue that these farms are sufficiently similar so that the different responses to unionization can be attributed at least in part to their different incentive schemes. Specifically, the farms are physically close to each other, similar on observables, and exhibit little selection among workers.[2] On Farm 1, lower union productivity indicates that these workers internalize the externality they impose on others more than non-union workers. On Farm 2, the absence of such an externality does not affect effort selection, consistent with the idea that it is the effort externality that distorts behavior on Farm 1.

To explain these results, I propose a reduced form model of social preferences in which workers place a weight on their co-workers utility. This weight incorporates two broad classes of models: altruism, which can either be pure or reciprocal, or collusion. Hence, when maximizing utility, workers behave as if they take into account how their behavior affects the well-being of their co-workers. I distinguish between these different classes of models by conditions imposed on this weight.

This approach is part of a recently growing literature which uses individual productivity

[2]In fact, management has anecdotally confirmed that they make no effort to select among workers.

data on farms such as these. The most obvious relation is to Bandiera *et al*, who in a series of papers use data from a UK fruit farm to investigate the impact of piece rates vs. relative incentives, social connections among workers, and social connections between workers and managers. Their data is well suited to their questions, but mine is especially useful to study the impact of unionization.

This paper contributes to literature on incentive schemes, social preferences in the workplace, and to a lesser extent unions in developing countries. As it relates to incentive schemes, I present a confirmation of Bandiera *et al*'s (2005) finding that workers internalize the externality imposed by higher effort under relative incentives. However, the results in this paper are different in that I do not have data for Farm 1 under piece rates, and so speak more to how social networks interact with preferences. Social preferences are often ignored in the theoretical literature of rank-based pay.[3]

Regarding social preferences in the workplace, this paper is related to a number of papers on collusion and social pressure. For example, Mas and Moretti (2008) use variation in coworker composition to estimate the spillover effects of the introduction of high productivity workers on others working the same shift; borrowing an idea from them, I exploit the fact that different workers are called upon to work on different days to estimate the effect of increased union members in a working group on individual output and group output variance. Theoretically, Kendal and Lazear (1992) build a model which introduces a peer pressure function directly into a worker's utility maximization program. This model would explain the results of this paper in a setting of social pressure; I distinguish between frameworks like this and reciprocal models of, for example, fairness[4] or inequality aversion[5].

Finally, this paper touches on issues about unions themselves, though that is not its focus. Rather, the unions on these farms are more of a form of collective identity than an instrument for collective bargaining.[6] I speculate that since the union is the strongest tie of

[3]See, for example, Nalebuff and Stiglitz (1983) or Lazear and Rosen (1981).
[4]Rabin (1993)
[5]Fehr and Schmidt (1999)
[6]As Freeman (2009) notes, "unions and collective bargaining are less important in developing countries

identity among workers on the farm, it is natural that a collusive agreement is best enforced among its members.

The rest of the paper is organized as follows. Section 2 presents the model of social preferences. Section 3 describes and analyzes the data for Farm 1 (relative incentives) while Section 4 does the same for Farm 2 (piece rates). Section 5 concludes.

2 A Reduced Form Model of Social Preferences

The goal of this section is to formalize the effects of piece rate and relative compensation when workers exhibit reduced form social preferences. Like in Bandiera *et al* (2005), these preferences are represented by workers placing a weight on co-workers' utility. Importantly here, this weight can depend on the worker's involvement with the union.

It is important to emphasize the sense in which I am using social preferences. Following Bandiera *et al* (2005), social preferences refer to models in which workers behave *as if* they place weight on their peers, which as discussed before covers models of both altruism and collusion. A more useful categorization is presented below, where I classify social preferences as either pure or dynamic. Under pure social preferences, the weight placed on co-workers is constant; this corresponds to a model of pure altruism (whose structural form coincides with the reduced form). Dynamic social preferences, on the other hand, refer to situations where social weighting is a function of other variables. This can describe models of reciprocity, which include concepts of fairness equilibria or inequality aversion,[7] or models of collusion, where the weight can be thought of being enforced through implicit networks of social pressure or explicit systems of punishment.

This model shows how workers will behave given the presence (or absence) of social preferences under the two incentive schemes.

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than in advanced countries."

[7]For important examples, see Rabin (1993), Fehr and Schmidt (1999), or Charness and Rabin (2002).

2.1 Setup

Consider a firm which employs n workers. Each worker i selects an effort level e_i, and produces $y_i = f(e_i)$, where $f'(e_i) > 0$ and $f''(e_i) < 0$. In return for their effort, workers earn wage w_i which is a function of their productivity, $w(y_i)$. However, effort is costly, represented by the cost of effort function $\frac{e_i^2}{2\theta_i}$. θ_i represents the inherent ability of worker i; given an effort level e_i, the cost of effort is higher for lower values of θ_i. Finally, worker i has payoff to wages $\phi(w_i)$, where $\phi'(w_i) > 0$ and $\phi''(w_i) < 0$.

Now, I introduce the union. Workers have an involvement with the union u_i, where $u_i \in [0, 1]$. $u_i = 0$ represents no involvement whatsoever; in the setting of this paper, this case is unlikely given that the union is a widely publicized group on the farm and about a quarter of workers are members. $u_i = 1$ indicates that worker i is a member of the union, while $u_i \in (0, 1)$ measures an involvement with the union not the result of membership or ignorance.

Social preferences are introduced into the model through the weight worker i places on her co-workers, π_i. π_i may be a function of many variables, such as hometown or working experience. Importantly for this setting, it may depend on u_i.

I now make the distinction alluded to above between pure and dynamic social preferences.

Definition 1 *Worker i is said to have pure social preferences if π_i is constant.*

In this case, note that $\frac{\partial \pi_i}{\partial u_i} = 0$, so that union involvement does not affect the weight π_i. Intuitively, pure social preferences are an inherent psychological trait of worker i, and so are not affected by changes in social networks. Consider now the other case.

Definition 2 *Worker i is said to have dynamic social preferences with respect to x_i if $\frac{\partial \pi_i}{\partial x_i} \neq 0$. Worker i is said to have dynamic social preferences if there exists an x_i such that $\frac{\partial \pi_i}{\partial x_i} \neq 0$.*

In this paper I am interested in the case of $x_i = u_i$. That is, I am interested in how social weighting changes with respect to union involvement. As discussed above, dynamic social

preferences describe behavior consistent with models of reciprocity[8] or collusion.[9]

Finally, I arrive that worker i's utility maximization program:

$$max_{e_i}\phi(w_i) + \pi_i \sum_{j \neq i} (\phi(w_j) - \frac{e_j^2}{2\theta_j}) - \frac{e_i^2}{2\theta_i} \tag{1}$$

The first order condition for a Nash Equilibrium, where worker i takes her co-workers effort as given, is

$$\frac{\partial w_i}{\partial e_i}\phi'(w_i) + \pi_i \sum_{j \neq i} (\frac{\partial \phi}{\partial w_j}\frac{\partial w_j}{\partial e_i}) - \frac{e_i}{\theta_i} = 0 \tag{2}$$

I now turn to examining effort selection using the definitions of π_i above in the case of relative incentives and piece rates, respectively.

2.2 Relative Incentives

With relative incentives, the wage a worker is paid is discounted by the average productivity of her peers.[10] Abstractly, wages take the form $w_i = \frac{y_i}{\overline{y}}$, where $\overline{y} = \frac{1}{n}\sum_{k=1}^{n} y_k$ is the average worker productivity on the farm. It it easy to show using the quotient rule that $\frac{\partial w_i}{\partial e_i} > 0$ and $\frac{\partial w_j}{\partial e_i} < 0$ for $j \neq i$.

Baseline: No Social Preferences

In this case, $\pi_i = 0$, so the first order condition (2) becomes

$$\frac{e_i}{\theta_i} = \frac{\partial w_i}{\partial e_i}\phi'(w_i) \tag{3}$$

Since worker i does not consider her co-workers when selecting effort, she naturally chooses the level which equates marginal benefit and marginal cost.

Pure Social Preferences

[8] Where π_i is a function of, for example, worker i's co-workers weights π_j or inequality in pay $w_i - w_j$.

[9] Where π_i is a function of, for example, deviation from the social norm or co-worker punishment.

[10] Technically, this is not a rank-order tournament because wage is based on workers' cardinal, not ordinal, rank.

The effort selection equation in this setting is the following:

$$\frac{e_i}{\theta_i} = \frac{\partial w_i}{\partial e_i}\phi'(w_i) + \pi_i \sum_{j \neq i} (\frac{\partial \phi}{\partial w_j}\frac{\partial w_j}{\partial e_i}) \tag{4}$$

This differs from equation (3) above precisely because worker i considers her co-workers in her maximization problem. If she cares positively about them, ie $\pi_i > 0$, then her effort is lower than in the baseline case because she now partially internalizes the externality her effort imposes; if $\pi_i < 0$, then she wants in to hurt her co-workers, so effort is higher.

To obtain the effect of the union, I differentiate expression (4) with respect to u_i to get

$$\frac{\partial e_i}{\partial u_i} = \theta_i(\frac{\partial \pi_i}{\partial u_i} \sum_{j \neq i} (\frac{\partial \phi}{\partial w_j}\frac{\partial w_j}{\partial e_i})) = 0 \tag{5}$$

since $\frac{\partial \pi_i}{\partial u_i} = 0$ by definition. Intuitively, pure social preferences are an inherent trait of worker i, and so are not affected by involvement with social groups such as the union.

Dynamic Social Preferences With Respect to the Union

Here, the comparative static with respect to the union is

$$\frac{\partial e_i}{\partial u_i} = \theta_i(\frac{\partial \pi_i}{\partial u_i} \sum_{j \neq i} (\frac{\partial \phi}{\partial w_j}\frac{\partial w_j}{\partial e_i})) \tag{6}$$

The difference from pure social preferences comes from the fact that π_i is now a function of the parameter u_i; in an intuitive sense, social preferences are more salient to union members. If $\frac{\partial \pi_i}{\partial u_i} > 0$, then $\frac{\partial e_i}{\partial u_i} < 0$. That is, if worker i places more weight on her co-workers utility as she becomes more involved with the union, she will select a lower level of effort.[11]

[11]It is easy to see that the opposite will be the case if $\frac{\partial \pi_i}{\partial u_i} < 0$; distinguishing between these two is ultimately an empirical issue.

2.3 Piece Rates

I conceptualize piece rates as a constant scalar α multiplied by output y_i, ie, $w_i = \alpha y_i$. Note that in this case $\frac{\partial w_j}{\partial e_i} = 0$ for $j \neq i$. Hence, effort selection for workers exhibiting social preferences is

$$\frac{e_i}{\theta_i} = \alpha\phi'(w_i) + \pi_i \sum_{j \neq i} (\alpha \frac{\partial w_j}{\partial e_i}) = \alpha\phi'(w_i) \tag{7}$$

Both types of social preferences discussed above simplify to the baseline case of pure self-interest. Since worker i has no effect on her co-workers' payoffs to work, she does not change her own effort selection.

3 Farm 1 (Relative Incentives) Empirics

3.1 Introduction and Data Description

Farm 1, a fruit farm in Ethiopia, provided data for the period between December 2006 and July 2008. This farm employs both temporary and permanent workers, in total about 200 for the given period. There are many tasks available, but for the purposes of this paper I use only the picking of one fruit, which ensures comparability of data points over workers and time.

The demographic characteristics of workers on this farm are quite varied. They are all female, and are largely drawn from five regions of Ethiopia. Most workers are a member of one of six large tribes, some with families to support. They also vary widely in their age and education level. Most workers are general workers, whose only task is to pick fruit. Some are assistant general leaders or group leaders, but these employees also must pick fruit and so are included in the analysis.[12]

Once hired by the farm, a worker is assigned to one of twelve groups, each with a supervisor who does not change over time. Group members work in close proximity to each

[12]The results presented here are usually stronger (ie, estimated coefficients are higher) and more significant (ie, standard errors are lower) if the sample is restricted to general workers only.

other, while workers from different groups do not. Hence, it is likely that the social networks formed in these groups affect productivity more than inter-group ones. On a given day, not all members of a group are called upon to work, so there is some variation in composition.

The task of picking fruit is simple and repetitive, so a worker's choice of effort on a given day is the driving force of their productivity. This is especially useful for the following analysis, since it is relatively easy to change production on the intensive margin given that hours worked is not directly in the worker's control.

Aggregate productivity data, as well as a worker's productivity and pay, is posted publically on a blackboard after approximately a three week delay. Hence, for a given day, perfect monitoring among co-workers is impossible, but workers also know that their rank will be posted in the future. It is thus quite easy to enforce a collusive agreement in this setting.

The farm employs a relative pay scheme, something management is happy with. It feels that the scheme nets out any common productivity shocks and ensures a more stable stream of income to its workers. Wages take the form $w_i = \lambda \frac{y_i}{\overline{y}} + b(y_i)$; that is, workers are paid according to their rank in the farm and some systematic bonus that is set *ex ante*. The key here is that $\frac{\partial w_j}{\partial e_i} < 0$ for $j \neq i$; that is, by working harder, workers impose a negative externality on their co-workers.

One may be concerned about the bonus distorting results if workers believe their performance will impact how management sets the bonus in the future. In this setting their are a number of reasons why this is unlikely.[13] First, the bonus is set weekly in response to specific concerns, so the effect a given worker has on it is weak. Second, given that production on the farm is stochastic, it is difficult for workers to distinguish between changes in the bonus due to conditions on the farm or overall worker ability. Finally, a similar bonus does not lead to distortion on Farm 2, so in as much as the institutional structures are similar, such a bonus is not likely to have an effect here.

The production technology is such that no other externalities imposed by worker effort.

[13]For a similar concern in Bandiera *et al* (2005), see the discussion on pg. 19.

Working groups pick a given field essentially until work runs out; if it does, workers are reassigned to other tasks on the farm. Hence, it is not the case that workers crowd each other out; in fact, the number called up to work upon by management is chosen so that this is not the case.

The union was introduced in October 2007 and about 25 percent of the workers on the farm joined. It is important to distinguish the role of the union on this farm and the typical role of a union in a developed country.[14] The union has no real power with respect to collective bargaining for wages or political influence with management. However, members of the union do from time to time come to management with requests and concerns about working conditions.

Importantly, the union is a mechanism by which the diverse set of workers on the farm forms a collective identity. Union members, who are drawn from a number of unique backgrounds, come together to attend meetings, spend time with each other, and feel part of something. Hence, the social ties among this group are likely to be particularly strong.

Productivity data was collected for all workers in the observation period, but demographic data is only available for about half of them. Specifically, 89 workers are observed in 12 groups over 603 days (only 595 of which are recorded), resulting in 70,805 observations. The survey of demographic characteristics was administered orthogonally to the determinants of productivity, conditional on common productivity shocks.[15]

3.2 Descriptive Analysis

Table 1 reports summary statistics of productivity, group size, and experience first over the entire sample and then over only working days. The mean of bags picked is almost four times as large using only active days, reflecting the opportunity cost of not being called upon to work. Predictably, the standard deviation is also larger for working days. Group size is on

[14] See Freeman (2009).

[15] To confirm this, I run a fixed effects regression $y_{igt} = \kappa_t + u_{igt}$ and regress the residuals from this on a dummy equal to unity if worker i was surveyed; the difference is insignificant at any convential significance level.

average larger on working days; hence, it appears managers try to cluster groups together. Finally, the mean of experience is higher on working days, reflecting a tendency of managers to choose more experienced workers to work on a given day.

Table 2 compares a host of variables between union and non-union workers on days when the union was present on the farm. Note that the difference is always negative; that is, union workers are deficient in all variables listed when compared to non-union workers. Their productivity is nearly half that of non-union workers. Since union workers are less likely than non-union workers to be selected for work, at least part of this difference must come from management bias away from union members. Union members also tend to work in smaller groups, although the composition of these groups tends to not change much.

Figure 1 graphs mean productivity on the farm by week for union and non-union workers on active days, thus capturing the difference at the intensive margin between the two groups. The dotted line represents workers that would eventually join the union, while the solid line represents those that would not. The reference line around week 50 on the x axis indicates when the union was established on the farm. While it is clear that after the union was introduced union member productivity was on average lower, it is not clear that the differences-in-differences estimator for the treatment group in the post period will be negative. I now turn to estimating this precisely.

3.3 Baseline Results

To identify the effect of union membership using variation both over worker and over time, I run the following panel data regression for worker i working in group g on day t:

$$y_{igt} = \alpha_i + \lambda_g + \kappa_t + \delta D_{it} + \beta Z_{igt} + \eta S_{gt} + \iota V_{it} + u_{igt} \tag{8}$$

where y_{igt} is productivity measured in bags of fruit picked. The variable D_{it} is a dummy that is active if worker i is a member of the union on day t. Hence, the coefficient of interest

is δ, which measures the effect of union membership on productivity.

α_i captures worker fixed effects, such as motivation for work or intrinsic ability for the task. Similarly, λ_g captures time-invariant determinants of productivity at the group level, such as supervisor strictness or group location on the farm. κ_t are day fixed effects and so absorb day-specific determinants of productivity.[16]

I further control for time-varying factors that may bias the estimate of δ. Z_{igt} is a set which measures the amount of workers active in group g on day t that are of the same tribe, residence, or education level of worker i. The idea behind this is to account for social factors that may influence productivity outside of the union. S_{gt} is group size, which varies over group and day. V_{it} is the number of days worker i has worked up to day t, and so is a measure of experience.

Since the unobservable determinants of productivity u_{igt} are unlikely to be independent across workers, I cluster standard errors at the worker level for all regressions in this paper, except where otherwise noted.[17]

Table 3 reports the results of the above regression. In the unconditional specification (1), the union does not have a significant effect on productivity. Adding in worker and group fixed effects in specification (2) causes the estimated δ to jump significantly higher, but controlling for day heterogeneity flips the sign. Hence, omitting common productivity shocks biased the estimate of δ greatly.[18] Controlling for group size in specification (4) does not change the estimate of δ much, nor does adding individual-varying factors in specification (5).

To get an idea of the magnitude of these effects, recall that the mean of bags picked over the entire sample period is 10.3753. Hence, a δ of -3.583934 represents a more than 34 percent decrease in productivity associated with union membership. Consistent with the erratic productivity of the farm, day fixed effects are very significant and greatly increase

[16]Essentially, δ is the differences-in-differences estimator of the treatment group in the post period; the other required dummies are absorbed by worker and day fixed effects.

[17]Clustering standard errors at the group and group-day level causes them to fall.

[18]Or, as δ is the differences-in-differences estimator of the treatment group in the post period, controlling for the period provides a more reliable estimate of δ.

model fit. Additionally, all the controls are highly significant.

Note that in this regression, the estimated effect of the union comes from two sources: selection for activity on a given day, and effort selection on active days. Distinguishing between these two effects is important to directly test the model of effort selection presented in Section 2.

3.4 Effect of the Union on Effort Selection

To address the concern above, I run regression (9) for only days when worker i is active. The results are presented in Table 4.

In the unconditional specification (1), the union once again does not have a significant effect. Accounting for worker and group heterogeneity causes the estimated union effect to be positive, something which is again reversed by the inclusion of day fixed effects in specification (3). However, while the estimated effect of the union is large, it is statistically insignificant from zero, with a p-value of about 12 percent. Controlling for group size in specification (4) lowers the p-value slightly, and by specification (5) it is less than 10 percent.

Compared to the mean productivity of active days, the estimated δ represents an almost 10 percent reduction in productivity. Hence, the union effect is lower at the intensive margin than the previous results would indicate.[19] But since this estimate is also less than zero, it is the case that union members do exert less effort on days when they are called to work.

Note also that none of the control variables are significantly different from zero in this specification. This indicates that productivity does not appear to be sensitive to social groups other than the union. In terms of the model in Section 2, π_i is independent of these groups.

Taken together, the results of this section suggest that (1) union members are less productive on days when called upon to work and (2) field managers are aware of this, leading

[19] In fact, running a dprobit regression for selection of active workers on a given day reveals that managers' only observable bias is away from union members.

them to tend not to choose union members for work.[20] There are two reasons why (1) may be true: either less productive workers select into the union, or the union itself is a treatment that lowers productivity internally.

3.5 Selection into the Union

This section is meant to address precisely the concern above. In it, I argue that there is no selection of less productive workers into the union; in fact, more able workers do sos.

Table 5 shows some unconditional differences of demographic variables between union and non-union workers. There is no significant difference in composition for any tribe, but there is for two of the residences. Additionally, the union has significantly more workers with an elementary school education. In the sense that these demographic variables capture underlying determinants of productivity, these results are somewhat reassuring because the differences are mostly insignificant. I now turn to empirically testing selection into the union on an explicit measure of ability.

A Measure of Ability

The first step is to create a measure of inherent ability.[21] To do this, I borrow an idea from Bandiera *et al* (2008) and run the following panel regression for only days when the union was not present on the farm and worker i was active:

$$y_{igt} = \alpha_i + \lambda_g + \kappa_t + \beta Z_{igt} + \eta S_{gt} + \iota V_{it} + u_{igt} \tag{9}$$

All variables are defined as before. This is essentially the same regression as in Section 3.4, restricted to the portion of the sample before the was present.

I use the estimated worker fixed effect, $\hat{\alpha}_i$, as the measure of ability for worker i. The idea behind this is that worker fixed effects capture individual, time-invariant determinants

[20] Though this bias could also be the result of managers having "personal reasons" to not select for union workers, unrelated to productivity, this seems highly unlikely and intuitively unappealing.

[21] Or, as Mas and Moretti (2008) call it, permanent productivity.

of productivity, controlling for other observable social and environmental factors. Since I restrict the sample disclude the union, these estimates are obtained without its effect. Finally, by using only observations from active days, I ensure that the estimated ability only comes from effort put forth in the field.

Selection Results

I now run the following dprobit regression:

$$D_{it} = \rho\hat{\alpha}_i + \tau T_i + \upsilon R_i + \varsigma S_i + \iota V_{it} + u_{it} \tag{10}$$

The variable definitions are as follows. D_{it} is once again a dummy for union membership and $\hat{\alpha}_i$ is the measure of ability. T_i identifies the tribe, R_i the residence, and S_i education level of worker i. Finally, V_{it} measures picking experience. Table 6 reports the results.

In specification (1), the p-value on the ability coefficient is nearly 95 percent, its highest over all specifications. Adding in fixed effects and controls over specifications (2) through (5) steadily lowers the p-value of ability to about 7 percent in the last specification. Hence, these results imply that more able workers select into the union; the union effect at the intensive margin, then, is internal.

Note that picking experience is highly significant in specification (5), an estimate that less experienced workers select into the union. This would be expected if the main draw of the union was a form of collective identity. Likely, newer workers are not as socially connected on the farm as veterans, so they turn to the union for support.

Discussion

Taken together, the results so far imply that the union is a treatment which lowers productivity internally. The most obvious reason for this behavior is that union workers internalize the externality of effort more than non-union workers as in the model of Section 2. However, it could also be the result of union mandate unrelated to externality.

I argue that this is highly unlikely. First, management has anecdotally confirmed that

the union is not a tool for collective bargaining *per se*, and so has no easily perceptible incentive depress productivity. Given that labor is relatively cheap and widely available, union members have strong incentive not to adhere to such a policy anyway.

Hence, the best explanation for these results is as in Section 2, ie, that the union depresses productivity in response to the wage externality. Here is confirmation both that social preferences exist with positive weight (ie, $\pi_i > 0$) for union workers, and that π_i is greater for these workers than their non-union peers.

In the following subsections, I qualitatively describe how such preferences manifest themselves and distinguish between different types.

3.6 Distinguishing Between Pure and Dynamic Social Preferences

I present evidence that pure social preferences (ie, pure altruism), as defined in Section 2, cannot explain these results. The first argument comes from the results of Section 3.5; since the union depressed productivity, it is true that $\frac{\partial e_i}{\partial u_i} < 0$ unless altruistic workers select into the union. Therefore I build theoretical motivation to test a measure of $\frac{\partial e_i}{\partial u_j}$.

Motivation

I derive two different predictions for the behavior of $\frac{\partial e_i}{\partial u_j}$ for $j \neq i$ in the case of pure and dynamic social preferences, respectively. Here, I am interested in the response of effort when co-workers become more involved in the union. For a given working day in which worker i is maximizing her utility, an increase in u_j could represent more of her co-workers being union members.

Recall the effort selection equation in the case of general social preferences:

$$\frac{e_i}{\theta_i} = \frac{\partial w_i}{\partial e_i}\phi'(w_i) + \pi_i \sum_{j \neq i} (\frac{\partial \phi}{\partial w_j}\frac{w_j}{e_i}) \tag{11}$$

With pure social preferences, $\frac{\partial \pi_i}{\partial u_j} = 0$, so $\frac{\partial e_i}{\partial u_j} = 0$, ie, effort does not change when more union members are present. Since worker i is purely altruistic, she is not influenced by the

presence of a given social group.

Under dynamic social preferences, differentiating effort selection with respect to u_j yields

$$\frac{\partial e_i}{\partial u_j} = \theta_i(\frac{\partial \pi_i}{\partial u_j} \sum_{j \neq i} (\frac{\partial \phi}{\partial w_j} \frac{\partial w_j}{\partial e_i})) \tag{12}$$

If π_i is independent of u_j, then the above expression is zero and it is impossible to distinguish between pure and dynamic social preferences. However, if $\frac{\partial \pi_i}{\partial u_j} \neq 0$, then $\frac{\partial e_i}{\partial u_j} \neq 0$, so it will be certain that preferences are dynamic.

Empirical Test

To distinguish between these two cases, I run the following regression for active days a month after the union was present on the farm:[22]

$$y_{igt} = \alpha_i + \lambda_g + \kappa_t + \delta_1 X_{gt} + \delta_2 D_{it} X_{gt} + \beta Z_{igt} + \eta S_{gt} + \iota V_{it} + u_{igt} \tag{13}$$

where all variables are defined as before and X_{gt} is the number of union workers active in group g on day t. Since I am in some sense trying to pick up the effects of the social network of the union, I wait a month after the union was introduced in order to give ample time for such a network to form. δ_1 thus captures the effect of one more union member in group g given that worker i is not a member; adding δ_2 to this measures the same effect for a union member. Table 7 reports the results.

This estimated δ_1 in specification (5) indicates that productivity decreases by more than 5 percent for each additional union member of the group, regardless if worker i is a union member or not. Since this shows $\frac{\partial e_i}{\partial u_j} < 0$, from above $\frac{\partial \pi_i}{\partial u_j} > 0$[23], so I can reject pure social preferences as the driving force of these results. Intuitively, since social preferences depend on changes in the social network of the union, they cannot be pure preferences, which are

[22] I am implicitly assuming that u_j increases as union members in the group increase. Alternatively, one could make the assumption that u_i, worker i's involvement with the union, increases as union members in group g increases.

[23] Or alternatively, $\frac{\partial e_i}{\partial u_i} < 0 \Rightarrow \frac{\partial \pi_i}{u_i} > 0$.

independent of such changes.

3.7 Differentiating Among Dynamic Social Preferences

A major shortcoming of the results presented so far is the inability to distinguish between models of reciprocity and collusion. It is difficult to discriminate intuitively between these two classes of models since evidence that seems to point to one also supports the other. For example, the social network of the union makes it easier for workers to both observe how others behave toward each other as well as enforce a collusive agreement. In this section, I argue that collusion is a more appealing explanation, though I cannot formally reject reciprocity.[24]

Evidence Among Pre-existing Social Networks

First, consider the period on the farm before the union was introduced. If some sort of reciprocity was the driving force of these results, one might expect to find depressed productivity among either a pre-existing social group or the workers that would eventually join the union. To investigate this, I run the following regression for only active days when the union was not present on the farm:

$$y_{igt} = \alpha_i + \lambda_g + \kappa_t + \delta_1 X_{gt} + \delta_2 D_i X_{gt} + \beta Z_{igt} + \eta S_{gt} + \iota V_{it} + u_{igt} \tag{14}$$

where all variables are defined as before except that now X_{gt} measures the amount of workers active in group g on day t that eventually joined the union, and D_i is a dummy variable for workers who would eventually join the union. The results of the above regression are presented in Table 8.

Specifications (1) through (4) add in controls as in the regressions presented previously. Of interest is specification (5), which identifies group effects for all observable social networks on the farm: placebo union members, tribes, hometowns, and education levels. Increasing

[24]In order to do this, there must be sufficient observations of workers leaving the farm. This is not available, and if it was, workers are uncertain over when their tenure at the farm expires.

presence of any of these groups has no significant impact on productivity, indicating that these networks do not exhibit any dynamic social preferences in response to the negative wage externality.

Hence, for reciprocity to be the driving force of the results, it would have to be the case that the introduction of the union generated preferences of this form without initial coordination or history of such action. The introduction of social pressure is a much more intuitively appealing process. The union, as a formally established network, is much easier to enforce a collusive agreement in. However, worker relationships within working groups are not otherwise changed by the introduction of the union. As workers best observe others' behavior within their group, the union should not be required for reciprocity to operate.

Evidence From Group Output Variance

I now turn to the variance of union and non union members on active production days one month after the union was present. Running a simple two-group variance comparison test, I find that union output variance is smaller than non-union output variance with probability 1. The standard deviation among non-union workers is 44.73356 bags per day, while the same statistic for union workers is 37.5635 – a reduction of about 16 percent.

Under a model of social pressure, there is a cost of deviating from the norm. This cost can either be implicit, such as social pressure or shame, or explicit, through systems of punishments, eg, trigger strategies. So one would expect that variance among those who feel pressure more – union members – to be lower. Under reciprocity, it is unclear that such a mechanism exists; as workers adjust effort in response to co-worker behavior, there is no systematic guarantee of output clustering around a norm.

Using this result as motivation, I now investigate the impact of union members on within group variance; since these groups are some of the most salient social networks on the farm, one would expect social norms to be most pronounced within, and not between, them. Figure 2 graphs the kernal density of standard deviation of output at the group-day level for groups of low union concentration (two or less union members) and groups of high union

concentration (three or more union members). As seen in the figure, groups with high union concentration are much more likely to have a lower output variance.

To estimate this effect more precisely, I define σ_{gt} as the standard deviation of output among members of group g on day t. I then run the following regression for active days one month after the union was present on the farm:

$$\sigma_{gt} = \alpha_i + \lambda_g + \kappa_t + \delta X_{gt} + \beta Z_{igt} + \eta S_{gt} + \iota V_{it} + u_{igt} \tag{15}$$

where all variables are defined as before. Hence, δ captures the effect of an additional union member active in the group on the standard deviation of group output. Since observations across groups on a given day are subject to mechanical correlation, I cluster the standard errors at the group-day level.[25] Note that this regression is still run at the individual level, so it accounts for individual determinants of group-day variance.[26] The results are presented in Table 9.

To interpret the estimated δ in specification (5), note that the mean of σ_{gt} is 26.61357, so an additional union member is estimated to decrease group output standard deviation by about 8.5 percent. The standard deviation of union members active in a group is 1.886945, so an increase of one standard deviation of union presence causes an estimated decrease of about 16 percent in the group output standard deviation.

Although this behavior is most likely the result of social pressure, it could also be argued to be the result of union targeting independent of the externality. However, there is little incentive for the union to do this, or for union members to adhere to such a strategy, as discussed in Section 3.4.

I now emphasize why this result is intuitively unappealing if reciprocity were the driving force of the union effect. As workers adjust their output to help or hurt their co-workers in response to their behavior, output variance would be driven up; and if the union only makes

[25] Clustering at the group or worker level causes standard errors to fall.

[26] Results are of course robust to running this regression at only the group level.

such preferences more salient, it is plausible that output variance would be driven up even more as more union members entered the group. Since the opposite is the case, I conclude that the best explanation for these results is a system of collusion enforced around a social norm.

Of course, I am not completely excluding reciprocity. It is likely the case that a combination of these factors lead to the observed behavior. However, the results do seem to indicate that social pressure is the dominant force at work.

4 Farm 2 (Piece Rates) Empirics

4.1 Introduction and Data Description

Farm 2 is a flower farm in Ethiopia which provided data for the period between January and November 2008. It is larger than Farm 1, employing over 1000 workers for a number of tasks. For the purpose of this analysis, I focus on the task of picking two types of flowers.[27]

Like in Farm 1, the task of picking these flowers is simple and repetitive enough that the range of worker effort at the intensive margin is quite large. The system of production is also similar to Farm 1: workers are assigned to one of eighteen groups, and are called up to work or not by field managers on a daily basis. These groups form the basis of social interaction on the farm, as workers come from a diverse set of residences, tribes, and education levels. Unlike Farm 1, data on hours worked is available. It reveals that when called upon, workers almost always worked an eight hour day.

This farm uses a piece rate system with bonuses for fast work and a minimum wage for activity. Wages thus take the form $w_i = \overline{w} + \alpha y_i + b(y_i)$. Note that there is no negative externality to worker effort, ie, $\frac{\partial w_j}{\partial e_i} = 0$ for $j \neq i$. In terms of the model in Section 2, effort selection collapses to the case of no social preferences.

[27] These flowers are very similar in growth, appearance, and measurement, so that productivity of workers picking the two is completely comparable. In fact, management does not distinguish between the two when paying out wages.

As with Farm 1, the production technology is such that there are no other externalities to effort. The discussion of bonus distortion on Farm 1 applies here except that the speed target is set once every three months. If there were any kind of ratchet effects present, this would decrease effort; however, as the union is found to have no effect at the intensive margin, I conclude that behavior is not any more distorted for union members. As on Farm 1, worker effort crowding out others is not a concern.

The union on Farm 2 was introduced in May 2008 and about 80 percent of the workers joined. The role of the union is very similar to Farm 1, although it stands to reason that it has more credibility as a collective voice given that most workers on the farm are members.[28] As a social group, the function of the union is similar to that of Farm 1, that is, its members form a collective unit in a way that the other workers do not.

Data is collected for all 1124 workers active for the given period, but demographic data only overlaps with 108 workers, who I observe over 315 days (with some gaps) for a total of 72,744 observations. The demographic survey was introduced orthogonally to productivity, conditional on common shocks.[29]

4.2 Descriptive Analysis

Table 10 reports summary statistics of productivity, group size, and experience over both the entire sample and active days. First, note how many observations were of inactivity; only 5,885 of the 72,744 sample worker-days record positive picking results. On active days, groups average around 5 members, and the average experience was 76.18743 days. Compared to overall experience, this indicates a selection bias towards experienced workers by management.

Table 11 compares relevant variables between union and non-union workers when the union was present on the farm. Union workers on average are more productive, more likely

[28] Anecdotally, management has given the impression that the real function of the union is to voice worker concern efficiently rather than be a vehicle for collective bargaining.

[29] To show this, I run the regression $y_{igt} = \kappa_t + u_{igt}$ and regress the residuals from this on a dummy equal to 1 if worker i was surveyed; the p-value of the difference is almost 90 percent.

to be chosen to work, and spend more time in the field. On the other hand, there is no significant difference in average group size or group composition. Taken together, it is difficult to disentangle selection effects or effort effects at the intensive margin.

Figure 3 graphs mean productivity on active days for union and non-union workers by week. The solid line represents non-union productivity, and the dotted line represents union productivity. The reference line around week 18 on the x axis represents the introduction of the union. In the before period, non-union work clearly dominates union work, something which is not so clear in the after period.

4.3 Baseline Results

To empirically identify the effect of union membership, I run the following panel regression for worker i working in group g on day t:

$$y_{igt} = \alpha_i + \lambda_g + \kappa_t + \delta D_{it} + \beta Z_{igt} + \eta S_{gt} + \iota V_{it} + u_{igt} \tag{16}$$

The variables are defined as in regression (9). That is, y_{igt} is productivity measured in bags of flowers picked. The variable D_{it} is a dummy for union membership, so again, the coefficient of interest is δ.

Worker fixed effects, α_i, capture time-invariant determinants of productivity at the worker level, and group fixed effects λ_g capture the same at the group level. I control for day specific shocks through day fixed effects κ_t. Z_{igt} measures the amount of workers active in group g on day t that are of the same residence or education level as worker i.[30] S_{gt} measures group size, and V_{it} is the number of days worker i has worked up to day t.

Table 12 reports the results. In specification (1), the union has a highly significant positive effect which holds up well to the addition of worker and group fixed effects in specification (2). The estimate is reduced a bit when accounting for day heterogeneity in specification (3)

[30]Unlike in Farm 1, I do not have data on the tribe affiliations of these workers.

and stays around that level through the addition of controls in specifications (4) and (5).

To get an idea of the magnitude of these effects, note that the mean of bags picked over the entire sample period is 1.810569, so the δ estimated in specification (5) represents a 45 percent increase in productivity associated with union membership.

In the final specification, group size is insignificant, but the demographic variation within group has a positive effect. However, as this regression does not account for inactivity, these estimates should not be interpreted as an effort selection response but rather the effect of biases in selecting workers for activity.

4.4 Effect of the Union on Effort Selection

I now run a regression to net out selection effects; that is, I run regression (14) for only active days. The results are reported Table 13.

The insignificant δ in specification (5) confirms the theoretical prediction of Section 2. Note that unlike Farm 1, there are significant returns to experience. Like Farm 1, other social groups do not affect productivity in any systematic way.

Taken together, the results imply that the union has no effect on productivity at the intensive margin. Since workers do not affect others' wages through their effort, this result confirms that social preferences do not have an impact here. It also confirms that there are no other externalities to effort, assuming that some workers would exhibit social preferences if this was not the case.[31]

Given the descriptive analysis in Section 4.2, it seems that the increased productivity in union members can be wholly attributed to management bias in selecting union members for work on a given day.

[31] In the sense that the production systems on Farm 1 and Farm 2 are similar, this is reassuring that such externalities do not exist on Farm 1.

5 Conclusion

So far, I have presented evidence that social preferences play a large part in determining the impact of unionization on productivity. Specifically, I have shown that when effort hurts co-workers, workers will partially internalize this externality more if they are a member of the union. When there is no effort externality, workers do not respond to unionization along the productivity dimension.

I now argue for the comparability of these two farms in order to infer that it was indeed the incentive scheme is at least partially responsible for the different reactions to unionization. First, the institutional structure on both farms is very similar, as described Sections 3.1 and 4.1. Specifically, production on both farms is done in groups under working supervisors who select active workers on a daily basis. A union was slowly expanding across Ethiopia at this time, and was introduced orthogonally to productivity.

Second, I argue that there is little selection of workers between farms. They are physically across the street from each other, similar on observables, and management has commented that selection of applicants is essentially random.

Table 14 reports the differences of demographic composition on the two farms. Note that a significant portion of the residential and educational variables are significantly different. However, running a dprobit regression of a dummy for membership on Farm 1 on residence, education, and age reveals the only significant selection comes from the Alemtena and first Modjo region. As much as these demographics capture underlying determinants of the response to unionization, this result is somewhat reassuring.

Though a bit tenuous, the discussion above indicates that part of the difference in responses to unionization can be plausibly attributed to the incentive schemes. Since the union is a strong social tie among workers on these farms, the contribution this paper makes is to explicitly incorporate and test the interaction of such social networks with different types of social preferences.

The confirmation of the model in Section 2 leads to situations when unionization could

ceteris paribus increase individual productivity. If the incentive scheme is such that there are positive externalities to worker effort (such as in team pay), then a group like the union would increase productivity in this group on top of existing social networks. Specifically, assuming that social preferences behave as found in this paper, it would be the case that

$$\frac{\partial e_i}{\partial u_i} = \theta_i(\frac{\partial \pi_i}{\partial u_i} \sum_{j \neq i} (\frac{\partial \phi}{\partial w_j} \frac{\partial w_j}{\partial e_i})) > 0 \tag{17}$$

Of course, it is likely that in more sophisticated settings, other factors may pollute this prediction. But the lesson remains: the interaction of social preferences and incentives is key to understanding worker behavior.

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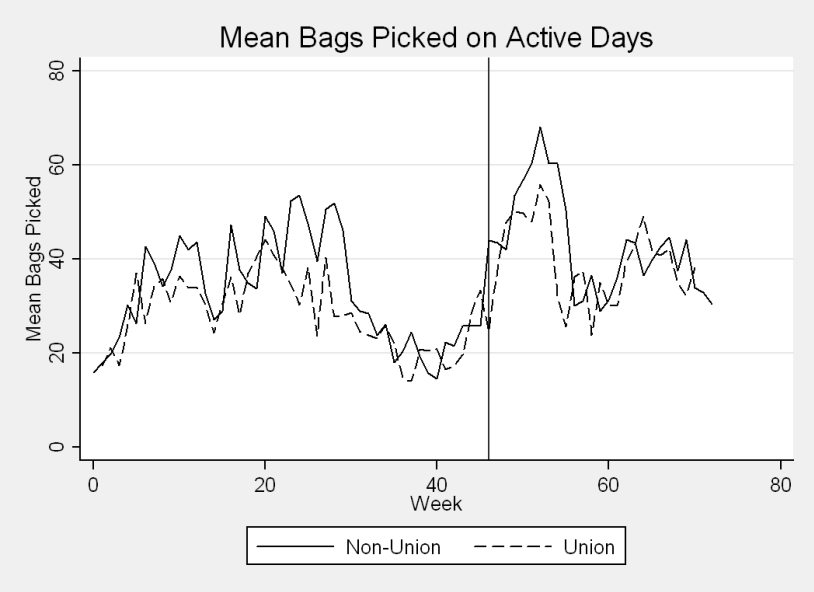
Figures

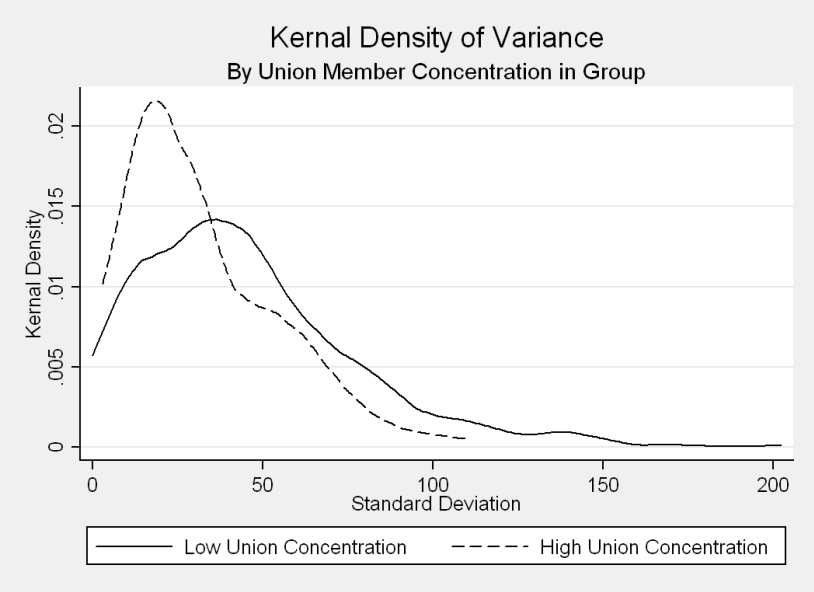
Farm 1 (Relative Incentives)



Notes: Solid line represents non-union worker productivity while the dotted line represents union worker productivity. Reference line included for introduction of the union.

Figure 1: Productivity by Union Member on Farm 1

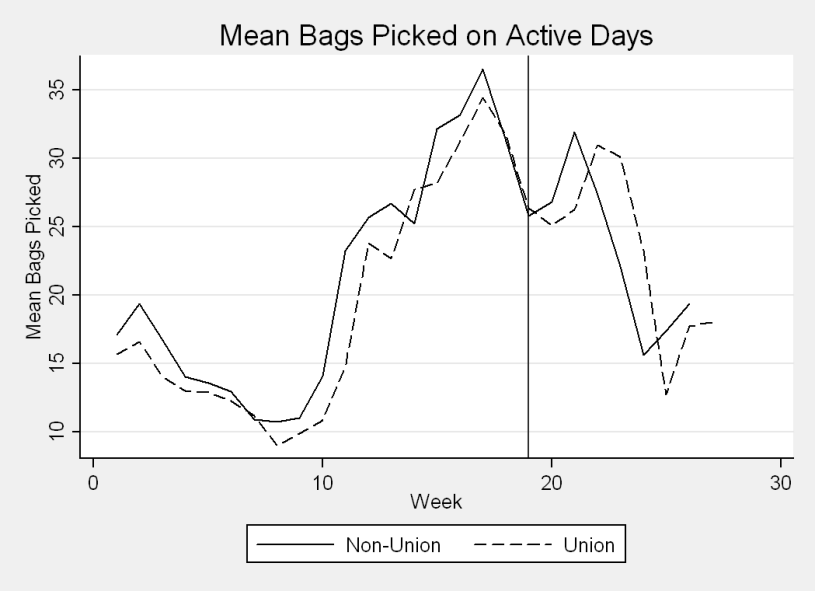
Farm 1 (Relative Incentives)



Notes: Low union concentration indicates less than or equal to two union members active in group *g* on day *t*; else, high union concentration.

Figure 2: Kernal Density of Group Output Variance on Farm 1

Farm 2 (Piece Rates)



Notes: Solid line represents non-union productivity, while the dotted line represents union productivity. Reference line included for introduction of the union.

Figure 3: Productivity by Union Member on Farm 2

Tables

Table 1: Farm 1 Summary Statistics

	Observations	Mean	Standard Deviation	Min	Max
Bags (whole sample)	70,210	10.3753	25.95865	0	418
Group Size (whole sample)	70,210	3.414756	3.245996	0	16
Experience (whole sample)	70,210	246.1017	164.4204	2	788
Bags (active days)	18,620	39.12191	37.63368	1	418
Group Size (active days)	18,620	5.914608	3.0832333	1	16
Experience (active days)	18,620	300.9778	158.2365	2	788

Table 2: Unconditional Differences Among Union/Non Union Workers When Union Present

	Non Union	Union	Difference
Bags/Day	16.55143	9.203241	-7.348189***
Probility of Working on A Given Day	.373885	.2500956	-.1237849***
Average Group Size	4.45948	3.744011	-.1237849***
Workers in Group From Same Tribe	2.372849	1.984312	-.398607
Workers in Group Form Same Residence	1.518808	1.1786287	-.3401793*
Workers in Group of Same Education	1.689681	1.5558354	-.133945

Table 3: Farm 1 Baseline Results

	(1) Unconditional	(2) Worker/Group Fixed Effects	(3) Day Fixed Effects	(4) Group Controls	(5) Individual Controls
Union	-.6192506	4.83959***	-3.690824***	-3.190737**	-3.583934***
	(1.570872)	(.925124)	(1.226494)	(1.229641)	(1.185291)
Group Size				1.732353***	-2.084293***
Experience					.02713**
Tribe Active					2.026385***
Residence Active					3.124535***
Education Active					3.725033***
Day Fixed Effects?	No	No	Yes	Yes	Yes
Individual Fixed Effects?	No	Yes	Yes	Yes	Yes
Group Fixed Effects?	No	Yes	Yes	Yes	Yes
Adjusted R^2	.0001	.1223	.2712	.2823	.3154
Number of Observations	70,210	70,210	70,210	70,210	70,210

Table 4: Farm 1 Effect of Union on Effort Selection

	(1) Unconditional	(2) Worker/Group Fixed Effects	(3) Day Fixed Effects	(4) Group Controls	(5) Individual Controls
Union	-2.605109	6.154817***	-3.388443	-3.431016	-3.492155*
	(3.131122)	(1.661194)	(2.138627)	(2.133963)	(2.094302)
Group Size				-.4369591*	-.3405397
Experience					-.0329034
Tribe Active					-.4545385
Residence Active					-.2046788
Education Active					.516721
Day Fixed Effects?	No	No	Yes	Yes	Yes
Individual Fixed Effects?	No	Yes	Yes	Yes	Yes
Group Fixed Effects?	No	Yes	Yes	Yes	Yes
Adjusted R^2	.0007	.1274	.3367	.3369	.3370
Number of Observations	18,620	18,620	18,620	18,620	18,620

Table 5: Farm 1 Unconditional Differences Among Union/Non Union Demographics

	Non Union	Union	Difference
Share of Amahara Tribe	.333333	.1836734	-.1496599
Share of Guraghie Tribe	.0144928	.0612245	.0457317
Share of Hadiya Tribe	0	.0204082	.020482
Share of Oromo Tribe	.6376812	.6732694	.0357882
Share of Welyta Tribe	.0144928	.0204082	.0059154
Share from Ajersa Region	.3478261	.1428572	-.2049689**
Share from Alemtena Region	.0144928	.0408164	.0263236
Share from Koka Region	.333333	.265061	-.0580272
Share from Modjo, First Region	.1594203	.3877551	.2283348**
Share from Modjo, Second Region	.1449275	.1632653	.0183378
Share with No Education	.2898551	.2857143	-.0041408
Share with Elementary Education	.1884058	.3877551	.1993493*
Share with High School Education	.5072464	.3265306	-.1807158
Share with Other (High) Education	.0144928	0	-.0144928

Table 6: Farm 1 Selection into the Union

	(1) Unconditional	(2) Tribe	(3) Residence	(4) Education	(5) Experience
Ability	.0001857	.0011139	.0017096	.0013047	.0042265*
	(.0020675)	(.0021613)	(.0020436)	(.0021265)	(.0021997)
Tribe		1 significant*** < 0	insignificant	1 significant*** < 0	1 signficant* > 0
Residence			1 significant* < 0	insignificant	1 significant* > 0
Education				insignificant	insignificant
Experience					-.0006673***
Adjusted R^2	.0000	.0228	.0584	.0589	.1090

Table 7: Farm 1 Social Networks of Union Members

	(1) Unconditional	(2) Worker/Group Fixed Effects	(3) Day Fixed Effects	(4) Group Controls	(5) Individual Controls
Union Members Active	-1.669968*	1.97006***	-1.883151**	-2.161337*	-2.1869369*
	(.937681)	(.5840879)	(.8434256)	(1.187338)	(1.174389)
Union*Union Members Active	-.1258837	-.4150225	-.4118073	-.4084885	-.4108986
	(1.066677)	(.8743776)	(.9561237)	(.9563695)	(.9294785)
Group Size				.307093	.5065013
Experience					.0140019
Tribe Active					-.6548522
Residence Active					-.3597255
Education Active					.6890035
Day Fixed Effects?	No	No	Yes	Yes	Yes
Individual Fixed Effects?	No	Yes	Yes	Yes	Yes
Group Fixed Effects?	No	Yes	Yes	Yes	Yes
Adjusted R^2	.0079	.1766	.3644	.3644	.3645
Number of Observations	8,920	8,920	8,920	8,920	8,920

Table 8: Farm 1 Social Networks Before Union Present

	(1) Unconditional	(2) Worker/Group Fixed Effects	(3) Day Fixed Effects	(4) Group Controls	(5) Individual Controls
Union Members Active	-1.517086**	.4075294	-.4619127	-.347062	-.3541056
	(.7392966)	(.4197583)	(.5053683)	(.6302595)	(.6248919)
Union*Union Members Active	-.485877	-.2311119	.1484735	.1451897	.1668079
	(.7720977)	(.6151373)	(.6262405)	(.6265328)	(.6273593)
Group Size				-.1399304	-.2205977
Experience					.0491306***
Tribe Active					-.2082932
Residence Active					.4089145
Education Active					.1679659
Day Fixed Effects?	No	No	Yes	Yes	Yes
Individual Fixed Effects?	No	Yes	Yes	Yes	Yes
Group Fixed Effects?	No	Yes	Yes	Yes	Yes
Adjusted R^2	.0114	.1198	.2892	.2891	.2890
Number of Observations	8,403	8,403	8,403	8,403	8,403

Table 9: Farm 1 Effect of Group Composition on Output Variance

	(1) Unconditional	(2) Worker/Group Fixed Effects	(3) Day Fixed Effects	(4) Group Controls	(5) Individual Controls
Union Members Active	-.7518911***	2.031221***	-2.402178***	-2.268543***	-2.250173***
	(.3220996)	(.5146829)	(.4723008)	(.4211225)	(.5791671)
Group Size				-.1500966	.1805059
Experience					.0008447
Tribe Active					-.6564802***
Residence Active					-.071999
Education Active					.0156572
Day Fixed Effects?	No	No	Yes	Yes	Yes
Individual Fixed Effects?	No	Yes	Yes	Yes	Yes
Group Fixed Effects?	No	Yes	Yes	Yes	Yes
Adjusted R^2	.0050	.0621	.4931	.4931	.4935
Number of Observations	8,532	8,532	8,532	8,532	8,532

Table 10: Farm 2 Summary Statistics

	Observations	Mean	Standard Deviation	Min	Max
Bags (whole sample)	72,744	1.810569	6.985904	0	83
Group Size (whole sample)	72,744	1.389118	2.397427	0	15
Experience (whole sample)	72,744	64.80497	30.19609	0	109
Bags (active days)	5,885	22.38029	11.9544	.5	83
Group Size (active days)	5,885	5.114189	3.045242	1	15
Experience (active days)	5,885	76.18743	23.33661	1	109

Table 11: Farm 2 Unconditional Differences Among Union/Non Union Workers When Union Present

	Non Union	(2) Union	(3) Difference
Bags/Day	1.788283	2.4500091	.6617261**
Probility of Working on A Given Day	.0616969	.0871146	.0254177**
Average Group Size	1.236106	1.2214159	-.0146001
Hours/Day	.409029	.5841603	.1751313**
Workers in Group Form Same Residence	.830251	.9084301	.0781791
Workers in Group of Same Education	.512397	.542918	-.133945

Table 12: Farm 2 Baseline Results

	(1) Unconditional	(2) Worker/Group Fixed Effects	(3) Day Fixed Effects	(4) Group Controls	(5) Individual Controls
Union	1.068248***	1.28017***	.806555***	.8034581**	.8162099**
	(.2137311)	(.1823183)	(.3087)	(.3120935)	(.3226509)
Group Size				1.02104***	.0453543
Experience					.0537466***
Residence Active					.4479312*
Education Active					1.593615***
Day Fixed Effects?	No	No	Yes	Yes	Yes
Individual Fixed Effects?	No	Yes	Yes	Yes	Yes
Group Fixed Effects?	No	Yes	Yes	Yes	Yes
Adjusted R^2	.0054	.0436	.1187	.1863	.2124
Number of Observations	72,744	72,744	72,744	72,744	72,744

Table 13: Farm 2 Effect of Union on Effort Selection

	(1) Unconditional	(2) Worker/Group Fixed Effects	(3) Day Fixed Effects	(4) Group Controls	(5) Individual Controls
Union	9.726004***	11.26063***	-.8208758	-.2838845	-.2674727
	(.8995385)	(.8764037)	(.9447613)	(1.012136)	(1.024194)
Group Size				-.0735841	-.0941252
Experience					.0634834***
Residence Active					-.0115157
Education Active					.0679454
Day Fixed Effects?	No	No	Yes	Yes	Yes
Individual Fixed Effects?	No	Yes	Yes	Yes	Yes
Group Fixed Effects?	No	Yes	Yes	Yes	Yes
Adjusted R^2	.1580	.3755	.6690	.6670	.6669
Number of Observations	5,885	5,885	5,885	5,885	5,885

Table 14: Selection Between Farm 1 and Farm 2

	Farm 1	Farm 2	Difference
Share from Ajersa Region	.2627119	.0346929	-.2298019***
Share from Alemtena Region	.0254237	.0329099	.0074862
Share from Koka Region	.3050847	.0202353	-.2848494***
Share from Modjo, First Region	.2542373	.8152143	.5608777***
Share from Modjo, Second Region	.1525424	.0914165	-.0611259
Share with No Education	.2881356	.607459	.3193234***
Share with Elementary Education	.2711864	.257695	-.0135569
Share with High School Education	.4322034	.1166282	-.3155752***
Share with Other (High) Education	.0084746	.0185547	.0098087