Fairness and Freight-Handlers:
A Test of Fair-Wage Theory in a Trucking Firm[*]

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ABSTRACT

We draw on evidence from an internal attitude survey in a national, unionized trucking firm to investigate the factors that influence employees' wage-fairness perceptions and the effect of such perceptions on employee performance. We find a robust association between the rate of unemployment in the local labor market and wage-fairness perceptions of employees in the firm, which we argue reflects a causal relationship. The gap between an individual employee's current wage and her predicted wage in the outside labor market has a similar, but less robust, effect. We also find modest support for the proposition that increases in wage-fairness perceptions generate improvements in employee performance, as measured by the rate of disciplinary dismissals.

I. INTRODUCTION

The fair-wage theory of efficiency wages, as formalized by Akerlof [1982] and Akerlof and Yellen [1990], is based on a simple causal proposition: the fairer an employee considers her wage, the harder she will work. The theory has captured the attention of an increasing number of economists, in part because it provides a parsimonious explanation for such long-standing empirical regularities as the existence of involuntary unemployment and the consistency of inter-industry wage differentials across occupational categories [Dickens and Katz, 1987; Katz and Summers, 1989; Krueger and Summers, 1986, 1987]. The theory accords with evidence from surveys of managers, who typically report that they believe fairness perceptions influence their employees' behavior and take those perceptions into account in their wage and employment decisions [Agell and Lundborg, 1995; Bewley, 1999; Blinder and Choi, 1990; Campbell and Kamlani, 1997; Foulkes, 1981; Kaufman 1984; Levine, 1993b]. A growing body of experimental literature also supports the theory: in laboratory games with monetary stakes [Fehr et al, 1993, 1997, 1998; Charness and Rabin, 2000], subjects consistently act in such a way as to reward behavior they perceive as fair and punish behavior they perceive as unfair, even at a cost to themselves.

The existing empirical literature on fairness, however, has left two important issues unresolved. First, we still know relatively little about the exogenous determinants of workers' fairness judgments in real workplaces. The experimental literature in economics, together with older literatures in psychology and sociology, has established that people tend to form fairness judgments in reference to an alternative transaction or aspect of behavior that has come to be seen as fair, often referred to as a *reference point* (see Kahneman, Knetsch, and Thaler [1986] and the review in Akerlof and Yellen [1990].) It also reveals, however, that the process by which an

alternative transaction comes to be seen as fair can be sensitive to apparently incidental details of the framing of an experiment or hypothetical situation. As a consequence, the experimental results are not a reliable indicator of whether employees in real workplaces form fairness perceptions in reference to the salaries of other employees in the same workplace, the profits of the firm, conditions in the outside labor market, or some other point of comparison.[1]

Second, existing studies have not been able to identify the causal effect of wage-fairness perceptions on employee performance in real workplaces. Experiments are able to assign subjects randomly to treatment groups, and have thereby been able to identify causal effects under carefully controlled conditions. The settings of such experiments are necessarily quite stylized and artificial, however, and subjects' behavior in them may not reflect how they would behave in actual work environments. A number of studies in real-life contexts have found positive correlations between relative wages, perceptions of wage fairness, and/or some measure of employee performance.[2] Because of data limitations, however, these studies have not been able to distinguish between the causal effect posited by the fair-wage theory, the effect of selection of highly productive workers with management-friendly attitudes into high-wage workplaces, and the effects of unobserved heterogeneity across firms or across plants within the same firm.[3]

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[1] The surveys of managers provide some clues to the process by which employees form fairness judgments, but it is not clear that managers' opinions of that process are accurate. Our results on unemployment in this paper, for instance, are inconsistent with the findings in Levine [1993b].

[2] Levine [1992a], Lincoln and Kalleberg [1990, 1996], and Cappelli and Sherer [1988] find that workers express more satisfaction with their wage when their wage is above the going market rate. (See also Akerlof, Andrew Rose, and Yellen [1988].) Cappelli and Chauvin [1991], Spitz [1993] Levine [1992b], Wadhwani and Wall [1991], and Huang et al [1998] investigate the reduced-form relationship between outside labor market conditions and productivity. Norsworthy and Zabala [1985a, 1985b, 1990] examine the relationship between employee attitudes and productivity (see also Straka [1993] for a critique of their econometric method.)

[3] Examples of such unobserved heterogeneity are differences in the ability of managers to motivate employees on a personal level, which might generate a correlation between employee attitudes and performance; and regional differences in the history of labor-management relations and work culture between the relatively high-wage industrial Northeast and Midwest and the relatively low-wage rural South, which might generate a correlation between relative wages and employee attitudes.

In this paper, we draw on evidence from an internal company attitude survey to address these two issues – what makes a wage fair, and what is the causal effect of wage-fairness perceptions on employee performance – in one particular set of workplaces: the freight-handling terminals of a large, unionized U.S. trucking firm. We have attitude data for 29 geographically dispersed terminals for each year over the period 1996-2000.[4] The institutional characteristics of the firm limit variation in internal wage structure, preventing us from identifying the internal determinants of fairness perceptions, but they are ideally suited to a study of the external determinants of those perceptions. Wages at each terminal are determined in collective bargaining at a national and regional level, and local managers have no discretion to vary wage rates in response to local labor market conditions. Economic shocks in the local area surrounding each terminal thus generate exogenous variation in the attractiveness of the wage paid by the firm relative to employees' options in the outside labor market.[5] We relate this variation to variation in fairness perceptions within each terminal. We then relate the exogenous component of variation in fairness perceptions to variation in a measure of employee performance.

Our strongest result is that there exists a robust association between the rate of unemployment in the local labor market and the wage-fairness perceptions of employees. After addressing plausible counter-arguments, we argue that this relationship can be given a causal interpretation: an increase in the local unemployment rate leads employees to consider that they are being paid more fairly, and a decrease has the opposite effect. The local unemployment rate, in other words, appears to be an important reference point – or at least a component of a

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[4] The firm operates more terminals than we have data for. We do not report the exact number of terminals in order to preserve the confidentiality of the firm.

[5] Because the variation in the relative attractiveness of the wage is not a consequence of intentional behavior by managers, our research design does not shed light on the importance of intentions in the formation of fairness judgments, as emphasized for instance in Rabin [1993]. Rather, we test the original formulation of Akerlof [1982], in which the effect of relative wage premia on fairness perceptions does not depend on how those premia are brought about.

composite reference point – for workers' fairness judgments. The gap between an individual employee's current wage and his predicted wage in the outside labor market has a similar, but less robust, effect.

In our second stage, we use indicators of local labor market conditions as instruments for wage-fairness perceptions to estimate the causal effect of such perceptions on employee performance. As an indicator of employee performance, we use the rate of disciplinary dismissals, which we assume varies inversely with the amount of effort or dedication to the job supplied by workers. We cannot definitively rule out the possibility that local labor market conditions affect the dismissal rate through an alternative mechanism, namely the effect on employees' fear of losing their job. But under the assumption that local labor market conditions affect the dismissal rate through their effect on wage-fairness perceptions rather than through their effect on such fears of job loss, we find that an increase in the wage-fairness perceptions of employees leads them to improve their performance. Our findings are not statistically significant in our strictest specification, but they provide modest support – stronger evidence than has yet appeared in the literature – for the key causal claim of the fair-wage theory.

Our paper is most closely related to the papers by Cappelli and Chauvin [1991] and Spitz [1993], who also examine the relationship between local labor market conditions and employee performance in different establishments of a single multi-establishment firm. Our paper has three main advantages over these previous studies: we have information on employee attitudes, and can examine directly the channel through which the fair-wage theory postulates that local conditions affect productivity; we can follow individual establishments over time, which allows us to control for unobserved heterogeneity among establishments; and we have more extensive information on the characteristics of individual workers at each workplace, and are better able to address the concern that our results are due to selection effects.

II. THE FIRM

The firm we study is a large, national carrier in the less-than-truckload segment of the U.S. for-hire freight-hauling industry. The term less-than-truckload, as opposed to truckload, refers to companies that mainly move freight smaller than the capacity of a standard tractor-trailer.[6] Unlike truckload companies, which require no special coordinating mechanism to ship freight between two points, all successful less-than-truckload companies maintain a network of distribution terminals to collect freight from surrounding catchment areas and consolidate it into tractor-trailer-size loads for shipment to other terminals. Many of the larger firms in the industry organize such local terminals into hub-and-spoke networks, with a second level of consolidation taking place at hubs. Prior to the deregulation of the trucking industry in 1980, most firms provided both truckload and less-than-truckload services. Following deregulation, the industry divided sharply, with most firms specializing in one or the other segment.[7] The less-than-truckload segment, with higher barriers to entry in the form of costs of establishing and maintaining a distribution network, has remained more oligopolistic than the truckload segment, although industry analysts agree that price mark-ups over costs are low [Nebesky et al, 1995] and in recent years smaller regional carriers have made inroads into the national market. The labor market in the industry has segmented in parallel with the product market, with wages

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[6] The capacity of an entire tractor-trailer is about 45,000-50,000 lbs. A typical shipment in this segment is 1,000 lbs.

[7] Industry analysts generally consider parcel carriers, such as the U.S. Postal Service and United Parcel Service (UPS), to be a third segment of freight trucking, distinguished by even smaller shipment sizes than firms in the less-than-truckload segment.

and union coverage declining sharply in the truckload segment, but only slowly in the less-than-truckload segment [Burks, 2002; Belzer, 1994, 1995, 2000].[8]

The hubs in the hub-and-spoke terminal networks are referred to in the industry as breakbulk terminals. The breakbulk terminals in the firm we study are evenly dispersed across the continental United States. In June, July or August of each year from 1996 to 2000, the firm paid an outside consultant to conduct an anonymous survey of attitudes of its employees. We have individual-level responses to the survey for 29 breakbulks.[9] In this paper we focus on the attitudes of dockworkers, the employees who load and unload freight. These workers are not drivers; they are stationed permanently on a loading dock in a particular terminal. The work they do is semi-skilled, requiring agile use of a forklift and some ingenuity to move and stack freight of varying size, weight, shape and fragility compactly and with a minimum of damage. We have data only on regular, full-time employees, not on contingent ("casual") employees. The attitude survey consisted of a series of statements – 20 in 1996-1998, 40 in 1999-2000 – to which respondents were asked to agree or disagree. The statements addressed various aspects of social relations within each terminal, including communication between employees and managers, the quality of working conditions, and work rules and procedures. We focus on the statement regarding wage fairness: "I feel I am paid fairly for the kind of work I do." Respondents filled in a bubble for one of three possible responses, "agree" "disagree" or "?". In 1996, 1997, and 1998, respondents were also asked to report their age, education, race, sex, and tenure in the firm. In 1999 and 2000, partly in response to employee complaints, the

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[8] Burks [2002] presents a theoretical explanation for this parallel segmentation of the trucking-industry labor and product markets, based on a combination of information asymmetries and fairness motivations in the employment relationship.

[9] One terminal (#12) does not have attitude data in 1999.

demographic questions were dropped, but the tenure question remained.[10] The average response rate to the attitude survey was 71.5 percent and varied little across breakbulks.

Summary statistics on the demographic composition of the workforce, based on the data available only in 1996-1998, appear in the first panel of Table I. The dockworkers in the firm are almost entirely male and approximately three-quarters white, with a higher-than-proportionate number of non-whites concentrated in a few terminals in the south. The modal worker is 31-40 years of age, with only a high school diploma, although over 40 percent are older than 40, and over 40 percent have some college experience or a college degree. Summary statistics on tenure in the firm and responses to the fairness question, available in all five years, are presented in the second panel of Table I. At least 35 percent of workers in the firm have more than 10 years of tenure,[11] and nearly 70 percent consider themselves to be paid fairly.[12]

Workers in the firm are unionized, and represented by the International Brotherhood of Teamsters. Two characteristics of the collective bargaining process are especially relevant. The first is that the pattern of changes in wages and working conditions are determined at a national and regional level by negotiations between the Teamsters union and a consortium of national trucking firms. The national negotiations, codified in the National Master Freight Agreement, set the pattern of wage increases over the life of the contract. Relatively small adjustments can then be made at a regional level in supplements to the national agreement, again as the result of negotiations between the union and the consortium of firms. The second

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[10] The possible responses for age were: (1) 16-24, (2) 25-30, (3) 31-40, (4) 41-50 and (5) over 50; for education: (1) Some high school, (2) High school degree, (3) Some college, and (4) College degree; for race: (1) White, (2) Black, (3) Hispanic, (4) Asian/Pacific Islander, and (5) Native American; for tenure: (1) <1 year, (2) 1-5 years, (3) 6-10 years, (4) >10 years. For the race variable, there were few Hispanic, Asian/Pacific Islander or Native American respondents; we included all four categories (2)-(5) in a single non-white category.

[11] The fraction may be higher, since this figure does not include missing responses.

[12] One unfortunate characteristic of the attitude data is that missing values were given the same code as "?" responses, and are indistinguishable from those responses. In unreported results, we estimate the models treating the "?" as missing, as "agree" responses, and as "disagree" responses. The results are not significantly different from those we report here.

noteworthy characteristic of the collective bargaining process is that in the days of James Hoffa Sr. in the 1960s, the Teamsters union successfully bargained for a nationally uniform wage for each category of employees, to prevent management from shifting work geographically to reduce wages [Levinson, 1981]. This wage structure persists, and still specifies nearly identical wages for workers doing similar jobs across the country, despite large variations in regional labor market conditions.

As a consequence of this institutional priority of the union, wages in the firm we study vary little across breakbulk terminals. Table III presents the base pay rates over the survey period for the 29 terminals. (To preserve the confidentiality of the firm, the locations of the terminal have been suppressed and replaced by a randomly assigned terminal number that remains constant throughout this paper.) Base wages never vary by more than plus or minus $.20 per hour; if we exclude one terminal in the industrial Midwest wages never vary by more than plus or minus $.11 per hour across terminals within each year. The standard deviation with a given year is never more than $.08. Wage increases each year were roughly constant across terminals. New (non-casual) hires receive 75 percent of the base wage initially, 80 percent after 1 year, 90 percent after 18 months, and 100 percent after 2 years, at which point they receive the base wage for the remainder of their tenure in the firm.

The crucial aspect of this wage-setting process for our study is that local managers have no discretion to adjust base wage rates at the terminal level. Variation in outside labor market conditions thus generates exogenous variation in the attractiveness of the wage paid by the firm relative to local labor market conditions. In addition, the fact that all terminals are part of the same firm and report to the same corporate managers guarantees a certain degree of homogeneity across terminals in workplace practices. There may still be differences in management styles and in the history of labor-management relations across terminals, however,

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and local managers do have discretion over how many overtime hours are offered to regular, full-time employees. We return to these possibilities below.

The firm provided us with data on the number of new hires and permanent separations as well as the total number of employees in each terminal in each year. For each separation, we also know the tenure of the employee at time of separation and the type of separation: dismissal, resignation in lieu of dismissal, quit, retirement or death. We take the rate of disciplinary dismissals – the number of dismissals and resignations in lieu of dismissal in a given calendar year as a fraction of total employment at the time of the attitude survey – as our measure of employee performance. This measure does not capture layoffs due to fluctuations of the freight flow (and hence of labor requirements) in each terminal. Under the union contract, permanent (i.e. not "casual") workers in the firm who are laid off retain indefinitely the right to be recalled; the firm does not count such layoffs as dismissals. The dismissal rate is a measure of serious behavioral infractions. The union grievance procedure makes it costly for the firm to fire employees without strong contractual grounds, and although it would be possible for the firm to build a case against an employee who had low productivity, typically dismissals are the result of a clear pattern of violations of contractually sanctioned disciplinary rules, such as those against stealing, coming to work drunk, excessive tardiness, or unexcused absences.[13] While the dismissal rate does not correspond exactly to the effort variable in many efficiency-wage models, namely the fraction of time spent working, it does provide a measure of employees' dedication to the job, or effort broadly construed.[14]

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[13] Failure to meet production standards is not valid grounds for dismissal under the National Master Freight Agreement, but related behavior, such as "stealing time" by taking excessive or unauthorized breaks, may be so construed.

[14] The paper by Cappelli and Chauvin [1991], perhaps the most convincing in the literature on labor market conditions and productivity, also uses the rate of disciplinary dismissals as the primary measure of employee performance.

The firm also provided us with the measure it uses internally to track the workload in each terminal. The firm's industrial engineers have calculated how long each task involved in loading or unloading a truck (e.g. "push empty cart into trailer," "carefully read freight label," "walk laden to cart unobstructed") should take to complete. On the basis of these measurements, they calculate the length of time the bundle of tasks that each freight load represents should take to complete. We refer to this measure as "expected work-time." Summary statistics on our terminal-level variables (as well as unemployment and the wage gap terms, which we explain below) appear in Table II.

III. LOCAL LABOR MARKETS

We focus on two indicators of local labor market conditions: (1) the local unemployment rate; and (2) the gap between employees' wages in the firm and the predicted wages that they would receive in the outside labor market based on their demographic characteristics. Of the 29 breakbulk terminals, 26 are located within Metropolitan Statistical Areas (MSAs), as defined by the Bureau of Labor Statistics (BLS), and one is located within 5 miles of an MSA. In these cases, we consider the local labor market to be the corresponding MSA. Two terminals, both in the southern U.S., are located well outside of the nearest MSA. In these cases, we take all non-MSA areas of the state in which each terminal is located as the local labor market.[15]

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[15] In the case of unemployment, it would be possible to define local labor markets more narrowly, but the BLS warns that its estimates of unemployment below the MSA-level may be subject to large and unquantifiable errors.

A. Local unemployment rates

Our source for unemployment data is the database of the Local Area Unemployment Statistics program, a joint effort of the BLS and state employment agencies.[16] Unemployment estimates are based on state unemployment insurance records, as well as estimates of new entries into the workforce based on demographic and seasonal patterns. Estimates of employment and unemployment at the state level, used in the case of the two terminals in rural areas, are based on the Current Population Survey (CPS). We take the average yearly unemployment rate in the local labor market as our unemployment measure.[17]

B. Wage gaps

We base our estimates of the wage an employee would receive in the outside local labor market on predicted values from wage regressions on pooled 12-month samples of Merged Outgoing Rotation Groups (MORGs) of the CPS, regressed separately for each local labor market in each year. We limit our CPS sample to men – as noted above, the dockworkers in the firm we study are 99 percent male – and further limit to ages 16-64.[18] We recode information on age, education, race and sex in the CPS according to the categories of the firm attitude survey, and calculate predicted wages in the local labor market with the following simple regression:

(1)
$$ w_{kjt} = p_{0,jt} + D_{1,kjt}' p_{1,jt} + D_{2,kjt}' p_{2,jt} + D_{3,kjt}' p_{3,jt} + e_{kjt} $$

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[16] The primary basis for employment estimates at the MSA-level are the joint federal-state Current Employment Statistics (CES) surveys, which gather information from worksites. The statistics are then converted to a place-of-residence basis using information from the Current Population Surveys (CPS) and the decennial censuses on commuting patterns.

[17] We experimented with an alternative specification of the unemployment rate, namely the average unemployment rate in June-August, the months in which the attitude surveys were carried out. Results were similar to those we report.

[18] We dropped individuals reporting hourly earnings less than $3/hr.

where k indexes individuals within a local-labor-market-year in the CPS, j indexes local labor markets, t indexes years, w_{kjt} represents the log of individual k's hourly wage, and $D_{1,kjt}$, $D_{2,kjt}$, and $D_{3,kjt}$ are vectors of dummy variables for age, education and race, defined according to the demographic categories in the firm's attitude survey. We are not able to estimate a more general model with a full set of interaction terms – the equivalent of taking averages for each age-education-race cell – because of insufficient numbers of observations for each MSA-year in the CPS. We experimented with alternative specifications, including a dummy for blue-collar occupations and limiting the sample to full-time workers, but these changes did not affect our results.

We construct the predicted wage for an employee in the firm we study in two different ways. In the first method, we calculate the proportion of employees in the firm in each age-education-race group in 1996 and use these proportions as weights in a weighted average of the predicted wages for each age-education-race group in the CPS. This is our preferred measure, because it allows us to construct an expected outside wage for all five years for which we have attitude data. In the second method, we use the demographic information from the attitude survey in the years 1996-1998 and equate each employee's expected outside wage to the predicted wage for a worker with identical age, education and race characteristics in the CPS regression. This method has the advantage that we take the human capital and other individual characteristics of workers into account in calculating their predicted outside wage, but the shortcoming that we can calculate the expected outside wage for only three years.

Taking the estimated coefficients from the CPS wage regressions, we calculate the two expected outside log-wage terms, call them w_1^e and w_2^e, as follows:

$$\text{(2a)} \qquad w^e_{1,jt} = \sum_g \mathbf{1}_{gj,1996} \left[\hat{\boldsymbol{p}}_{0,jt} + D_{1,gjt}' \hat{\boldsymbol{p}}_{1,jt} + D_{2,gjt}' \hat{\boldsymbol{p}}_{2,jt} + D_{3,gjt}' \hat{\boldsymbol{p}}_{3,jt} \right]$$

$$\text{(2b)} \qquad w^e_{2,ijt} = \hat{\boldsymbol{p}}_{0,jt} + D_{1,ijt}' \hat{\boldsymbol{p}}_{1,jt} + D_{2,ijt}' \hat{\boldsymbol{p}}_{2,jt} + D_{3,ijt}' \hat{\boldsymbol{p}}_{3,jt}$$

where g indexes all possible age-education-race combinations, j indexes terminals, t indexes years, $\mathbf{1}_{gj,1996}$ is the proportion of dockworkers in terminal j in year 1996 corresponding to age-education-race combination g, and i indexes employees within a terminal-year.[19]

Our constructed wage gap terms, call them gap_1 and gap_2, are then the difference between the log of the within-firm hourly base wage taken from the collective bargaining agreements (refer to Table III), and the expected outside log-wage:

$$\text{(3)} \qquad gap_{q,ijt} = W_{ijt} - w^e_{q,ijt} \qquad \text{for } q=1,2$$

where W_{ijt} is the log of the base wage. Although $w^e_{1,jt}$ does not vary across individuals within a terminal-year, W_{ijt} does vary, because of differences in tenure, and hence so does $gap_{1,ijt}$. Table II contains summary statistics for the local unemployment rate and the two gap terms.

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[19] The expression for w_1^e can be simplified to the following:

$$w^e_{2,ijt} = \hat{\boldsymbol{p}}_{0,jt} + \overline{D}_{1,j}' \hat{\boldsymbol{p}}_{1,jt} + \overline{D}_{2,j}' \hat{\boldsymbol{p}}_{2,jt} + \overline{D}_{3,j}' \hat{\boldsymbol{p}}_{3,jt}$$
$$\text{(2c)}$$

where $\overline{D}_{1,j}$, $\overline{D}_{2,j}$, and $\overline{D}_{3,j}$ are the means for terminal j and year 1996 of the vectors of dummy variables $D_{1,ijt}$, $D_{2,ijt}$ and $D_{3,ijt}$.

IV. THE EXTERNAL DETERMINANTS OF FAIRNESS PERCEPTIONS

A. Econometric Model

One consequence of the near-uniformity of wage structure across the terminals is that the gap between the wage employees receive in the firm and their expected outside wage varies significantly in the sample, with the 5-year terminal average of our gap_1 measure varying from .26 to .59, corresponding to a variation in dollar terms from approximately $4.15 per hour at certain terminals in the West and Midwest to approximately $8.05 per hour in the rural South. As we will report below, this cross-sectional variation in the wage gap is correlated with cross-sectional variation in fairness perceptions. The correlation, however, may not reflect a causal relationship. There may be unobserved heterogeneity across terminals correlated both with the wage gap and employee attitudes, for instance if employees are inherently less likely to think their wage is fair in regions of the country with histories of labor-management conflict (i.e. the industrial Midwest and Northeast) and these regions also happen to be the places in which the average wage gap is low. [20]Also, higher wages may allow terminals to hire higher-quality employees who may inherently have more positive attitudes; if such selection occurs slowly, over long periods of time, then the selection effect will be approximately constant over the five years of our study.[21] A stricter test of the wage gap-fairness relationship would control for time-invariant influences such as regional cultural differences or long-term selection effects on fairness perceptions. For this reason, we include terminal fixed effects in our baseline estimates.

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[20] The finding in Ichino and Maggi [2000] of persistent differences in the rate of absenteeism and employee misconduct in North and South Italy is another example of such regional heterogeneity in attitudes and work discipline.

[21] We want only to entertain the possibility that the firm is able to hire higher-quality workers in periods of labor market slack, not to assert that firms actually do so. An important premise of our research agenda is that worker quality is not completely pre-determined in an individual, but is at least in part endogenous to the complex of social relationships within a particular workplace.

The period of our study, 1996 to 2000, saw a steady expansion of the national economy and a steady tightening of labor markets. Our indicators of local labor market conditions display common time trends across terminals in the direction of lower wage gaps and lower local unemployment. If fairness perceptions are characterized by a time trend that is also common across terminals but unrelated to local labor market conditions, then in our estimation of the effect of local conditions on those perceptions we may pick up a spurious association between the two trends. To control for this possibility, as well as for region-invariant factors such as the size of the wage increase in the National Master Freight Agreement or company-wide changes in human resource policies, we also include year effects in some estimations.

It may be that workers with certain types of observable characteristics are inherently more likely to think their wage is fair or unfair. When we use gap_1 and all five years of data, we include indicators for tenure category. When we use gap_2 and limit our estimation to the years 1996-1998, we include a full set of indicator variables for age, education, race, sex and tenure categories. We might also expect the nature of the freight flow to affect workers' fairness perceptions; the more onerous the task of unloading or loading, the less fair we would expect a worker to perceive his or her wage. The firm's expected work-time measure has been designed to capture differences in the amount of time required to move particular loads of freight, and we take it as an indicator of the onerousness of the work.[22] The composition of freight is determined by factors outside of each breakbulk, and can be taken to be exogenous to employee attitudes and performance within that terminal.[23]

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[22] The expected work-time measure does not wholly capture the onerousness of the freight flow. Other factors that may affect how taxing a dockworker perceives a particular freight load to be, but that are not fully accounted for in the expected work-time calculation, include how fragile the freight is, how well packaged, and how awkward it is to handle. We feel it is reasonable to assume, however, that conditional on expected work-time, these factors are random and simply enter the disturbance term.

[23] The nature and quantity of freight shipped is clearly not exogenous to the choices and performance of the firm as a whole. A shipment from, say, California to New York, however, will pass through perhaps two

We rank the responses to the fairness question in the order "disagree", "?", "agree", and estimate the model as an ordered logit.[24] Our basic econometric model for analyzing the determinants of fairness perceptions, expressed as a latent-variable model, is thus the following:

(4)
$$f_{ijt}^{*} = \boldsymbol{q}_0 + gap_{q,ijt}\boldsymbol{q}_1 + U_{jt}\boldsymbol{q}_2 + y_{ijt}{}'\boldsymbol{q}_3 + s_{jt}{}'\boldsymbol{q}_4 + \boldsymbol{f}_j + \boldsymbol{m}_t + v_{ijt}$$

(5)
$$f_{ijt} = -1 + \sum_{r=1}^{3} 1(f_{ijt}^{*} \geq c_r)$$

where r indexes the responses to the fairness statement, f_{ijt}^{*} is the latent fairness response, f_{ijt} is the observed fairness response (coded –1, 0, 1), and the c_r (for r=1, 2, 3) are cut-points; i indexes individuals within a terminal-year, j indexes terminals, and t indexes years; $gap_{q.ijt}$ (for q=1, 2) is one of our constructed wage gap terms; U_{jt} is the local unemployment rate, y_{ijt} is a vector of indicators variables for individual characteristics, the dimension of which will vary according to which years of data we use; s_{jt} is the logarithm of expected work-time; $\boldsymbol{f}_j$ is a terminal fixed effect; $\boldsymbol{m}_t$ is a year effect; and 1( ) is an indicator function, taking the value 1 if the enclosed expression is true, 0 otherwise. The distribution of the error term, v_{ijt}, is assumed to be logistic. The standard errors we report in all the tables below have been corrected to account for noise in measurement of the gap term; for derivations of the adjustments to the variance-covariance matrix, see Murphy and Topel [1985]. In addition, to correct for possible correlation

breakbulks along the way, and attitudes in those breakbulks have little influence over what the customer in California decides to ship.

[24] We also estimated the model assuming various codings of the "?" responses – as missing, as "agree", and as "disagree." The results, which are available from the authors, are not significantly different from those that we report.

of the errors within terminal-year due to the fact that our unemployment variable does not vary at the individual level [see Moulton, 1986], we cluster errors by terminal-year.

B. Results

Figure 1 presents a graphical depiction of our main results on the determinants of fairness perceptions. Figures 1a and 1c present scatterplots of the average fairness perception for each terminal over the period 1996-2000 against the average wage gap (using gap_1) and the average local unemployment rate respectively. [25] Figures 1b and 1d present the terminal averages of the same variables for each year deviated from the 5-year terminal averages; these graphs are analogous to the estimations that include terminal fixed effects. In all four graphs, the regression lines are weighted by the number of respondents in each terminal. (The sizes of the circles in figures 1b and 1d are proportional to the number of respondents.) The graphs reveal a weak but statistically significant correlation between fairness perceptions and the wage gap in cross-section; the correlation remains once time-invariant terminal-specific factors are removed. The most remarkable pattern in the data is evident in figures 1c and 1d: unemployment bears essentially no relation to fairness perceptions in cross-section, but a strong and readily apparent relation once terminal fixed effects are removed. Year-to-year variation in the local unemployment rate is a strong predictor of year-to-year variation in wage-fairness perceptions.

Table IV presents our baseline estimates of the effect of local labor market conditions on wage-fairness perceptions. As suggested by figure 1, when terminal fixed effects are not included in the estimation, there is a significant relationship between the wage gap and fairness

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[25] In calculating the average fairness perception, as well as in the linear first-stage regressions in section V below, "agree" responses to the fairness question were assigned the value 1, "disagree" the value -1, and "?" the value zero.

perceptions but not between unemployment and fairness perceptions. Once we include terminal fixed effects in column (4), however, the positive relationship between unemployment and fairness perceptions shows up strongly, suggesting that changes in local unemployment rates are more salient for fairness judgments than average levels. The t-statistic for the coefficient on unemployment is greater than 7. The coefficient on the gap term remains significant at the 95 percent level. [26]

As discussed above, the strictest test of our hypotheses requires that we include year effects as well as terminal fixed effects, to control for possibly spurious correlation between unrelated time trends in local labor market conditions and fairness perceptions. Once we include year effects in column (5), the magnitude of the unemployment coefficient drops by more than 50 percent, but remains strongly significant. We conclude that the local unemployment rate is a quite robust predictor of wage-fairness perceptions.[27]

The gap term is not as robust as the unemployment term; with the inclusion of terminal effects, the coefficient on the gap term is no longer distinguishable from zero. There are at least two possible explanations why the wage gap term is less robust a predictor of fairness perceptions than the unemployment rate, one statistical and one economic. The statistical reason is that the wage gap terms are constructed from estimates of wage coefficients from a CPS wage regression, which are measured with noise. This noise biases the coefficient estimate downward and may be obscuring an underlying economic relationship between the true wage gap and fairness judgments. The economic reason is that the unemployment may simply be more salient as a reference point for fairness judgments than the predicted outside wage.

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[26] Many authors have observed that over time people tend to regard the status quo, whatever it may be, as fair (see Wadhwani and Wall [1991] for a review of this literature.) This accommodation-to-the-status-quo effect would tend to reduce the effect of changes in local labor market conditions on self-reported fairness perceptions, and work against finding significant coefficients on the unemployment and wage gap terms.

[27] We return to columns (6) and (7) of Table IV in section IV.C below.

Unemployment is more visible than outside wages; newspapers run stories about it, and people out of work can be seen on the streetcorner. By contrast, it is unlikely that a worker would know what he or she would earn on the outside labor market unless he or she had recently looked for a job. It is important to keep in mind as well that not being able to reject the null hypothesis that the coefficient on the wage gap term is zero when year effects are included is not the same as rejecting a null hypothesis that the coefficient is positive; one should infer from our study only that the data are not conclusive in our strictest specification, not that expected outside wages do not affect fairness perceptions.

It is also important to note that our strictest specification may be too strict: the year effects in column (5) may be absorbing variation in wage-fairness perceptions that should rightfully be attributed to local unemployment and the wage gap.[28] The rationale for including year effects is to control for spurious correlation between unrelated time trends in local labor market conditions and in wage-fairness attitudes. If such spurious correlation were important, we might expect to see a spurious correlation between local labor market conditions and other attitudes that are closely related to wage-fairness perceptions but arguably not affected by local labor market conditions. The firm's attitude survey included an indicator of such an attitude: the perception of the fairness of management in general. The survey in 1996-1998 elicited responses to the statement, "I have confidence in the fairness of management." Unfortunately for our purposes, in 1999 and 2000 the wording changed slightly to "I have confidence in the fairness of management *above my immediate supervisor*" (emphasis added). Table V presents our basic models estimated with the responses to this management-fairness question as the dependent variable. The estimates are markedly different from those for the wage-fairness

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[28] In addition, there is always the danger that including the year effects will exacerbate attenuation bias due to measurement error in the unemployment and wage gap terms, if the year effects are correlated with the signal but not the noise in these local labor market variables. Such an effect is consistent with the reduction in the size of the coefficients on the unemployment and wage gap terms that we observe in column (5) of Table IV.

question. In column (1), which does not include year effects, the coefficient on the gap term is positive as before, but only marginally significant, and the coefficient on unemployment is negative and insignificant. The estimates in column (2) include year effects, which should absorb the effect of the change in wording and should be preferred for that reason. The coefficient on the gap term is still positive but no longer significant. The coefficient on unemployment is more negative than in column (1) and still insignificant. Local labor market conditions, in other words, appear to be related to perceptions of wage fairness, not to perceptions of fairness in general. We take this as indirect evidence that the year-to-year changes in fairness perceptions that are common across terminals are in fact attributable to the common trend in local labor market conditions. For this reason, we remain reasonably confident in our estimates in column (4), and consider them to be our baseline estimates.

Table VI presents the marginal effects corresponding to the coefficient estimates in columns (4) and (5) in Table IV, which give a sense of the economic significance of our results. The effects in columns (1)-(3), corresponding to the model including terminal fixed effects but not year effects, indicate that an increase of 1.1 percent (one standard deviation) in the local unemployment rate is associated with a 10.2 percent increase in the probability that the average employee in the firm will consider his wage fair, and a 8.6 percent decrease in the probability that he will consider it unfair.[29] A one-standard-deviation increase in the wage gap term will raise the probability of a fair response by approximately 2.7 percent, and decrease the likelihood of an unfair response by 2.3 percent. The corresponding numbers for the model including both terminal and year effects are 2.9 percent and 2.1 percent for unemployment, and .2 percent and .2 percent for the wage gap.

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[29] As is typical in ordered logit models, we have no unambiguous prediction for the effect on the probability of the intermediate choice, the "?" response.

In addition to the results for the unemployment rate and the wage gap, the variables of primary interest, the results in Table IV also reveal that tenure is a remarkably robust predictor of employee wage-fairness perceptions in the firm we study. Employees are decreasingly likely to consider their wage fair as their tenure increases. There are at least two possible explanations. One is that the tenure profile in the firm reaches the maximum wage quickly: workers with 25 or 30 years of seniority are paid the same wage as those with 2 years. While this reflects the bargaining priorities of the union as a whole, it may not reflect the notions of fairness of all individual employees. Another possible explanation is a change in overtime-allocation rules in the 1994-1998 National Master Freight Agreement. Prior to 1994, terminal managers were not allowed to hire temporary, "casual" dockworkers until all of the regular dockworkers had worked all the overtime hours they wished to work. Beginning with the 1994-1998 contract, terminal managers have been allowed to hire casual dockworkers as soon as all regular dockworkers have worked 40 hours in a given week. Because the wage rate for casuals has been significantly lower than the overtime rate for regular dockworkers, they have tended to do so. The result has been a significant decline in overtime earnings for regular dockworkers since 1994. At the same time, a large category of hourly employees with whom dockworkers interact frequently, pick-up and delivery drivers for the local area around each breakbulk, saw no such change in overtime earnings. High-tenure dockworkers who were employed before 1994 may resent the change in overtime policy more than low-tenure workers. Unfortunately, because our attitude data only covers the period 1996-2000, we are not able to distinguish the effect of the 1994 change in overtime regime from the effect of the short tenure ladder.

Our first wage gap measure, gap_1, does not take advantage of all of the information on observable characteristics of the workforce available to us. It may be that observable characteristics such as age, race, sex and schooling are important determinants of fairness

perceptions and that changes in the observable composition of the workforce are responsible for the correlation between local labor conditions and fairness perceptions. To check for this possibility, we estimate our basic econometric model using our second wage gap term, gap_2, and the data on demographic characteristics for 1996-1998. Table VII presents the results. Perhaps surprisingly, age, race, sex and schooling appear not to be strong predictors of fairness perceptions. The coefficient on the indicator for age > 50 years is significant and positive in column (3),[30] but is no longer significant once terminal fixed effects are included. The fact that the demographic variables are not significant in column (6), with the wage gap and unemployment excluded from the equation, suggests that collinearity with the wage gap is not responsible for the non-results for the demographic variables in the other columns.

Results for the gap_2 term are weaker than those for gap_1 reported in Table IV: the gap_2 term is no longer significant once we include terminal fixed effects. We attribute the lower significance level of the gap_2 term to two main factors. First, in constructing the gap_2 term we are no longer taking a weighted average across all age-race-sex-schooling groups as we did in constructing the gap_1 term; the gap_2 term is consequently a noisier measure. Second, to carry out the estimations in Table VII, we had to discard approximately 40 percent of our data. The smaller sample size will naturally lower significance levels.[31] Results for the unemployment term are also weaker. The coefficient on the unemployment term is still strongly significant when we control for terminal fixed effects only, but no longer significant when we include year effects. We attribute this difference, again, to the smaller sample size in these estimations.

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[30] Note that older workers are more likely to think their wage is fair only when we control for tenure as well. Higher-tenure workers are less likely to think their wage is fair. The workers with the most positive outlook toward their wage, in other words, are older workers who have been recently hired.

[31] There is an additional statistical reason why the gap_2 term may be a less robust predictor of attitudes than the gap_1 term. The gap_2 term is a linear combination of the individual characteristics, where the coefficients for the combination are drawn from the CPS regressions, and is only identified because we allow the CPS coefficients to vary across terminal-year, while the coefficients on the individual characteristics are constrained to be constant. The individual characteristics may thus be absorbing some of the variation in fairness perceptions that is in fact due to the wage gap.

We now turn to the question of whether the strong and robust relationship between unemployment and wage-fairness perceptions is causal. The relationship is clearly not due to simultaneity: unemployment in an entire labor market is not appreciably affected by fairness perceptions in one workplace. Here we consider two other plausible counter-arguments: that the association is due to selection effects and that it is due to heterogeneity across terminals in the provision of overtime work.[32]

In periods of high unemployment in the local labor market, the firm may be able to hire better-quality workers for a given wage. If these better-quality workers are inherently more likely to have a positive attitude regarding the fairness of their wage, then we will observe a positive correlation between unemployment and fairness perceptions. Since we cannot follow individual employees over time, we cannot control for such selection directly. One way to evaluate the importance of this selection effect is to examine the extent to which terminals are selecting on observable characteristics that indicate worker quality. To do this, we define worker quality as the rank of an individual in the wage distribution in the local labor market and then calculate, for each employee in the years in which we have demographic data (1996 to 1998), the percentile rank of an individual with identical age, education and race characteristics in the CPS sample in each local labor market. We then calculate the median of these ranks for the workforce within each terminal. We calculate the median ranks separately for all dockworkers and for dockworkers with less than one year of tenure. Figure 2a presents a

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[32] Another possible counter-argument is that the correlation between unemployment and wage-fairness perceptions is due to bias in response rates, if employees who feel that their wage is unfair are less likely to respond to the survey when unemployment is high, because they doubt that the survey is completely anonymous and are more afraid of losing their jobs than when unemployment is low. In unreported results, we find no correlation between local unemployment and response rates. Also, response rates are higher for high-tenure workers, who are typically more likely to think their wage is unfair. It is conceivable that the fear of management retribution is reflected not in non-response to the survey, but rather in misreporting of attitudes in the direction of greater fairness. The respondents to the survey were protected by a union grievance procedure, however, and it is unlikely that they would fear firing on the basis of a response to a survey the firm portrayed as anonymous.

scatterplot of the median percentile rank for all dockworkers in each terminal against the local unemployment rate, with both variables deviated from terminal means. Figure 2b presents the same variables deviated from both terminal and year means, analogous to including both terminal and year fixed effects. Figures 2c and 2d present the same scatterplots for dockworkers with less than one year of tenure only. If selection on the basis of worker quality were responsible for the correlation between unemployment and fairness perceptions, we would expect to see positive covariation between unemployment and the median rank of employees of the firm, reflected in clustering in the northeast and southwest quadrants of these scatterplots. No such clustering is discernable, even for the new hires. It does not appear that managers select workers with higher observable quality in years with high unemployment than in years with low unemployment.

The foregoing exercise does not rule out the possibility that terminals are selecting on unobservable worker quality, however, and to address this possibility we take an alternative approach. The argument for selection presumes that terminal managers are better able to hire workers with positive attitudes when unemployment is high than when it is low. If this were the case, we would expect the wage-fairness perceptions of newly hired workers to be more responsive to the local unemployment rate than those of workers with more tenure, since the total effect of local unemployment on the wage-fairness perceptions of newly hired workers would be the sum of two effects: the direct effect of unemployment on their wage-fairness perceptions, and the effect of terminal managers being more able to hire workers with positive attitudes when unemployment is high.[33] Columns (6) and (7) of Table IV present estimates of our basic model with unemployment interacted with the dummy variables for the four tenure

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[33] Theories of internal labor markets, such as that of Doeringer and Piore [1971], suggest that low-tenure workers may be less insulated than high-tenure workers from conditions in outside labor markets. This would lead us to expect that low-tenure workers would be even more responsive to outside unemployment.

categories. The slope of the fairness-unemployment relationship is *steeper* for the tenure categories 1-5 years, 6-10 years and >10 years than for <1 year, the omitted category. For both column (6) and column (7), we can reject the hypothesis that the coefficient for the lowest tenure category dummy is greater than the coefficient for the second-lowest category at the 95 percent confidence level in one-tailed tests. It is not the case that the fairness perceptions of new hires are more sensitive to unemployment than those of higher-tenure workers, which militates against the argument that selection of new hires with management-friendly attitudes is driving the fairness-unemployment correlation. In addition, the collective bargaining contract dictates that lay offs be implemented in strict reverse-order by seniority, hence terminal managers are not free to select who is laid off on the basis of attitudes or productivity.

A final way to evaluate the importance of the selection effect is to examine the correlation between local unemployment and the rate of dismissals. If terminal managers were actively selecting higher-quality workers with more positive attitudes in periods of high unemployment, we might expect to see them firing more workers in such periods to take advantage of the presumably higher-quality pool of applicants. Figures 4a and 4b show, however, that the correlation between unemployment and the dismissal rate is negative, both in cross-section and deviating from terminal means. Because we do not observe evidence that terminals are selecting on the basis of observable characteristics, nor that wage-fairness perceptions of new workers are more sensitive to unemployment than those of higher-tenure workers, nor that terminals fire more workers when unemployment is high, we conclude that selection effects are unlikely to be the entire explanation for the positive correlation between unemployment and wage-fairness perceptions.[34]

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[34] We also performed a fourth check of the importance of selection effects, in the spirit of the trimming-for-bounds approach of Lee [2002]. For each terminal in each year, we constructed a counterfactual sample that included both the currently employed workers and all of the workers who were fired or quit over the previous

While individual terminal managers in the firm do not have discretion over base wage rates, they do have discretion over the amount of overtime work offered to employees. It is possible that terminal managers increased the amount of overtime offered when local unemployment was high, giving rise to a positive correlation between unemployment and earnings, and hence to the observed positive relationship between unemployment and wage-fairness perceptions. Figure 4a plots overtime hours as a fraction of total hours in each terminal against the local unemployment rate, both deviated from terminal means; figure 4b plots the same variables deviated from both terminal and year means. The correlation between the ratio of overtime to total hours and unemployment, to the extent that there is one, is negative. The most likely explanation is that in periods of low unemployment terminal managers faced shortages of employees on less-desirable shifts and were not able to meet these staffing needs with casual dockworkers at straight-time rates, and hence had to offer more overtime. It is also possible that managers offered overtime in order to discourage experienced employees from leaving to take other jobs. In any case, it does not appear that unobserved heterogeneity is responsible for the fairness-unemployment correlation.

Neither selection bias nor the most likely source of omitted variables bias appears to explain the unemployment-fairness correlation. We are not aware of other omitted variables that plausibly account for the correlation between year-to-year changes in unemployment and year-to-year changes in average wage-fairness perceptions,[35] and feel confident that the

year. We assumed that the wage-fairness perceptions of the workers who were fired or quit were the least favorable for our results – "unfair" in years when the local unemployment rate was above the terminal average, "fair" when it was below – and performed the same analysis. We found that the "worst-case scenario" coefficient on the unemployment term changed little and remained strongly significant when terminal effects but not year effects were included, but was smaller and no longer significant when both terminal and year effects were included. The first result argues in favor of the claim that our results are not due to selection, but the second implies that we cannot on the basis of this exercise definitively rule out the possibility that selection is driving the fairness-unemployment correlation.

[35] One of us (Burks) was a participant-observer in the industry for 10 years, driving tractor-trailers and working on docks (including, for a short time, as a dock casual in the firm we study), and we feel confident that we

relationship can be interpreted as a causal effect: an increase in the local unemployment rate leads employees to consider that they are being paid more fairly, and a decrease has the opposite effect.

V. THE EFFECT OF WAGE-FAIRNESS PERCEPTIONS ON EMPLOYEE PERFORMANCE

There are a number of reasons why a simple regression of employee performance on employee attitudes might be misleading: a positive correlation between employee wage-fairness perceptions and performance might be due to the selection effect discussed above or to an omitted variable like the ability of individual managers to motivate employees, for instance, rather than to the causal effect hypothesized by fair-wage theory. A key advantage of having identified exogenous determinants of wage-fairness perceptions is that we can now use them as instruments to identify the causal effect of wage-fairness perceptions on employee performance. We do so here in a modified two-stage least squares model, using the rate of disciplinary dismissals as our indicator of employee performance.[36] To facilitate the interpretation of our results, we adopt a linear model, rather than an ordered logit or binary

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are not overlooking any obvious omitted variables that might be correlated with both unemployment and fairness judgments.

[36] The firm also provided us with the measure of productivity it uses internally, namely the ratio of expected work-time (described above) to the actual work-time taken to unload the freight. We experimented with using actual work-time, controlling for expected work-time, as our indicator of employee performance, but our results were inconclusive. It is possible that the actual work-time depends on a variety of factors outside of dockworkers' control – the availability of forklifts, the timing of arrivals of trucks (which may determine whether they can be unloaded at the most convenient dock) etc – and hence does not respond as directly to employee effort as the rate of disciplinary dismissals.

We also explored the relationship between local labor market conditions, wage-fairness perceptions and the quit rate in each terminal. The results are broadly similar to those using the dismissal rate (and in other studies such as Campbell[1993]): higher unemployment and a higher wage gap (and hence more positive wage-fairness perceptions) are associated with a lower quit rate. These results are consistent with the idea that slack in the local labor market leads to improved morale which, in turn, makes employees more willing to stay in the job. It may also be the case, however, that the lower quit rate is due simply to the fact that employees have less attractive options outside the firm, and for that reason we do not emphasize these results.

logit, for our first-stage regression of fairness perceptions on local labor market conditions.[37] Because we have data on disciplinary dismissals only at the terminal-year level, our covariates in the second stage are the terminal-year averages of the predicted fairness response and the covariates from the first stage.[38]

Our first stage model is essentially the same as in equation (4) above, with the fairness responses coded −1, 0, 1 and the error assumed only to have a conditional mean of zero. Our second stage model is:

$$(6) \qquad R_{jt} = \boldsymbol{g}_0 + \bar{f}_{jt}\boldsymbol{g}_1 + \bar{y}_{jt}\boldsymbol{g}_2 + s_{jt}\, \boldsymbol{g}_3' + \boldsymbol{f}_j + \boldsymbol{m}_t + u_{jt}$$

where R_{jt} is the dismissal rate; $\bar{f}_{jt}$ and $\bar{y}_{jt}$ are terminal-year averages of $\hat{f}_{ijt}$, the predicted values from the first stage, and y_{ijt} as defined above; s_{jt} is the logarithm of expected work-time, and f_j and m_t are terminal and year effects, as above. The error term u_{jt} is assumed to be mean-zero conditional on our covariates. In our estimation, we adjust the standard errors in our second-stage equation to account for the noise in the terminal-year-average fairness term, $\bar{f}_{jt}$, arising both from the noise in the gap term and from the noise in the estimation of the coefficients in the fairness equation.

Our estimate of the coefficient on the terminal-year average fairness term, $\bar{f}_{jt}$, will be a consistent estimate of the effect of fairness perceptions on the dismissal rate under two assumptions: first, that our instruments, unemployment and the gap term, are uncorrelated with

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[37] We also carried out the analysis using a binomial logit (treating "?" as missing) in the first stage, and a linear model in the second stage. Such a model fits in the general framework for two-step estimators of Murphy and Topel [1985]. We obtained essentially the same results as when we used a linear model in the first stage, however, and for that reason we report results for the more familiar linear model here.

[38] In this sense, our model is not a standard two-stage least squares model. It does, however, fits in the general two-step framework of Murphy and Topel [1985], and gives consistent estimates.

u_{ji}; and second, that local labor market conditions influence the dismissal rate *only* through wage-fairness perceptions. The second assumption, the exclusion restriction, is particularly vulnerable to criticism. The labor-discipline theory of efficiency wages [Bowles, 1985; Shapiro and Stiglitz, 1984] also predicts that local labor market conditions will affect the dismissal rate, but acting through a different channel: as a worker's wage rises relative to his outside options he will work harder, not because he considers the wage more fair and wants to reciprocate, but rather because he is more afraid of losing the job if caught shirking. In our data, the fair-wage theory and the shirking theory are observationally equivalent; they differ only in the subjective mental state they ascribe to employees. Our results in this section should thus be viewed as valid conditionally: if local conditions affect the dismissal rate only through fairness perceptions, then we have identified the causal effect of fairness perceptions on the dismissal rate.[39] Judgment about whether the condition is true must be based on how well the theories account for other sets of facts.[40]

Table VIII reports the results for the first-stage, second-stage and reduced form equations. The results in columns (1) and (3) for the first stage in our linear two-stage model are similar to those for the ordered logits in columns (1) and (2) of Table IV. In column (2), we include a new covariate, a dummy variable for 1997. In August 1997, a major strike at United Parcel Service (UPS), led to a significant, temporary upsurge in the volume of small packages in

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[39] There is another channel through which local labor market conditions may affect the dismissal rate: when the local labor market is slack, hiring costs may be lower, and so the overall cost of replacing workers may decline. This would generate a positive correlation between unemployment and the dismissal rate, however, and would work against the fair-wage hypothesis.

[40] The fact that inter-industry wage differentials are consistent across occupational categories has been taken as evidence for the fair-wage theory (generally augmented by the supposition that profit rates, as well as local labor market conditions, are a reference point for fairness judgments) against the shirking theory. In order to explain this consistency, the shirking theory requires that differences in monitoring technologies across industries be consistent across occupations, which has struck many researchers as unlikely (see, for instance, Krueger and Summers [1986]).

the firm we study.[41] The firm hired a number of new employees to adjust to the increase. Although the dismissal rate does not include layoffs, the firm may have had a greater incentive to reduce the size of the workforce after the UPS strike ended, and this may have induced the firm to seek a greater number of dismissals than it would otherwise have sought. We include the 1997 dummy to control for this possibility. The first-stage results in column (2) are similar to those in columns (1) and (3).

In the second stage, the coefficients on the average predicted fairness response are negative and significant at the 95 percent level in column (4) and at the 99 percent level in column (5). We argued above that one can have confidence in our results even without year effects. If so, and the exclusion restriction is valid, then these results provide support for the key causal claim of the fair-wage theory: the fairer employees consider their wage, the more effort they supply. The estimates suggest that the effect is economically important: if 10 percent of employees switch from considering their wage unfair to considering it fair, then the dismissal rate will fall by between 1.04 percent and 1.2 percent per year. The mean dismissal rate in our sample is 2.2 percent, hence such a decrease would cut the average dismissal rate approximately in half. Once we include a full set of year effects in column (6), the standard error on the average predicted fairness term rises, and the coefficient is no longer statistically significant. Note that the magnitude of the coefficient remains roughly constant, however.

Columns (7)-(9) present reduced-form results of regressions of the dismissal rate on unemployment and the wage gap. We have already seen the main reduced-form result in figure 4b: as unemployment rises, the dismissal rate falls. The coefficient on the unemployment term is negative and significant at the 95 percent level in both columns (7) and (8), with and without

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[41] As mentioned above, UPS, which has a maximum single parcel weight of 150 lbs., is normally considered to operate in a different market segment than less-than-truckload firms, which have average shipment weights of about 1,000 lbs. It is not difficult for less-than-truckload firms to accommodate small parcels, however, and many did so during the UPS strike.

the 1997 dummy. The estimates suggest that a 1.1 percent (one standard deviation) increase in the unemployment rate will lead to reduction in the dismissal rate of approximately .8 percent, about one-third of the mean dismissal rate in the sample – again fairly significant in economic terms. Once we include year effects in column (9), however, the coefficient on unemployment drops to approximately 40 percent of its magnitude in columns (7) and (8) (a decrease similar to the drop we see when year effects are included in the first stage), and statistically it is no longer significant.

Although not robust to the inclusion of a full set of year effects, these results constitute stronger evidence than has appeared in previous empirical tests of efficiency wage theories. The best-known studies [Cappelli and Chauvin, 1991; Wadhwani and Wall, 1991; Levine, 1992b], which have estimated the reduced-form relationship between outside labor market conditions and some indicator of productivity, have not controlled for plant or firm fixed effects, much less plant or firm effects and year effects simultaneously. In addition, we have been able to test directly the mechanism through which local labor market conditions are hypothesized to affect employee performance in the fair-wage variant of efficiency-wage theory.

VI. CONCLUSION

This paper has presented strong, robust evidence that the unemployment rate is an important reference point for wage-fairness judgments in the firm we study. It has presented slightly less robust evidence that the predicted wages employees would receive in the outside labor market play a similar role. To our knowledge, ours is the first study based on observations of employees in real workplaces to identify arguably exogenous determinants of employees' wage-fairness perceptions. While our research design does not permit us to evaluate the relative

importance of internal vs. external reference points in the formation of wage-fairness judgments, our results do suggest that in the future formal models and empirical tests of the role of fairness perceptions should explicitly take both outside unemployment and outside wages into account.[42] An interesting question that remains unanswered is whether the unemployment rate affects fairness judgments simply because it enters into an individual's calculation of his or her expected payoff in the outside labor market or because the unemployment rate in itself is a salient reference point.

The paper has also presented modest evidence in favor of the key causal claim of the fair-wage theory: that the fairer employees' consider their wage, the harder they will work. These results are not definitive – in particular, they rely on an exclusion restriction that is open to question, and they are not robust to the inclusion of a full set of year effects – but they represent an advance on the current state of empirical knowledge in the field.

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[42] Akerlof's original paper [1982] allows for external unemployment and predicted wages to influence fairness judgments and the provision of effort, and our results suggest that this is appropriate.

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Table I
Summary Statistics, Individual-Level Variables

Demographic data, 1996-1998		Percentage	
Number of Responses			10389
Sex	Male	96.5	
	Female	1.5	
Race	White	75.4	
	Non-white	20.5	
Age	16-24	3.5	
	25-30	14.8	
	31-40	37.2	
	41-50	25.8	
	>50	15.9	
Schooling	Some HS	4.4	
	HS degree	49.1	
	Some college	34.0	
	College degree	7.9	

Tenure and Fairness Responses, 1996-2000			
Number of Responses			17231
Tenure	<1 yr.	7.2	
	1-5 yrs.	23.9	
	6-10 yrs.	24.6	
	>10 yrs.	35.1	
Fairness Question	Agree	69.4	
	?	8.7	
	Disagree	21.9	

Note: Number of missing values can be inferred by summing over responses for each variable.

Table II
Summary Statistics, Terminal-Level Variables and Wage Gaps

Variable	N	Mean	Std. Dev.	Min	Max
log(expected work-time)	144	0.478	0.521	-0.417	1.823
unemployment	144	0.040	0.011	0.023	0.077
dismissal rate	144	0.022	0.019	0	0.097
separation rate	144	0.063	0.039	0	0.269
gap1 (1996-2000)	15657	0.395	0.113	-0.132	0.748
gap2 (1996-1998)	9230	0.418	0.194	-0.841	1.483

Notes:
(1) One terminal (#12) does not have attitude data in 1999.
(2) Expected work-time is measured in 100,000s of hours

Table III
Base Hourly Wage Rates, All Terminals

Terminal Number	1996	1997	1998	1999	2000
1	18.06	18.46	18.46	18.81	19.16
2	17.96	18.36	18.36	18.71	19.06
3	17.96	18.36	18.36	18.71	19.06
4	17.99	18.39	18.39	18.74	19.09
5	17.98	18.38	18.47	18.82	19.17
6	17.91	18.31	18.31	18.66	19.01
7	17.96	18.36	18.36	18.71	19.06
8	18.06	18.46	18.46	18.81	19.16
9	18.06	18.46	18.46	18.81	19.16
10	18.12	18.52	18.52	18.87	19.22
11	18.06	18.46	18.46	18.81	19.16
12	18.06	18.46	18.46	18.81	19.16
13	18.06	18.46	18.46	18.81	19.16
14	17.95	18.35	18.35	18.70	19.05
15	17.96	18.36	18.36	18.71	19.06
16	17.96	18.36	18.36	18.71	19.06
17	17.91	18.31	18.31	18.66	19.01
18	18.06	18.46	18.46	18.81	19.16
19	17.96	18.36	18.36	18.71	19.06
20	17.95	18.35	18.35	18.70	19.05
21	17.96	18.36	18.36	18.71	19.06
22	17.98	18.38	18.47	18.82	19.17
23	18.00	18.40	18.70	18.95	19.20
24	17.95	18.35	18.46	18.81	19.16
25	17.95	18.35	18.35	18.70	19.05
26	18.12	18.52	18.52	18.87	19.22
27	18.06	18.46	18.46	18.81	19.16
28	18.06	18.46	18.46	18.81	19.16
29	18.06	18.46	18.46	18.81	19.16
Std. Dev.	0.059	0.059	0.080	0.069	0.062

Notes:
(1) Wages effective as of April 1 of each year.
(2) In 1998, all employees received a contract-signing bonus of $750, in most cases in lieu of a wage increase.
(3) New hires recieve 75% of base wage initially, 80% after 1 year, 90% after 18 months, 100% after 2 years.

Table IV
Ordered Logit Estimates Using gap1, 1996-2000

Dependent Variable: response to wage-fairness question

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
unemployment rate	4.504	3.579	6.071	39.887***	17.252***	23.972*	-1.319
	[4.287]	[4.615]	[10.175]	[4.980]	[5.779]	[13.496]	[12.818]
gap1		0.567*	3.42***	1.045**	0.15	1.01*	0.085
		[0.342]	[1.232]	[0.518]	[0.512]	[0.521]	[0.514]
1-5 yrs tenure			-1.253**	-0.581***	-0.312*	-1.463***	-1.264***
			[0.517]	[0.197]	[0.196]	[0.495]	[0.478]
6-10 yrs tenure			-1.774***	-1.107***	-0.858***	-1.822***	-1.649***
			[0.489]	[0.198]	[0.195]	[0.524]	[0.508]
>10 yrs tenure			-1.906***	-1.22***	-0.956***	-1.629***	-1.429***
			[0.461]	[0.183]	[0.187]	[0.509]	[0.494]
log (expected work-time)			-0.44*	-0.523	-0.2	-0.517	-0.192
			[0.249]	[0.363]	[0.361]	[0.368]	[0.363]
unemployment*(1-5 yrs tenure)						23.144*	25.216**
						[11.872]	[11.656]
unemployment*(6-10 yrs tenure)						18.868	21.054*
						[12.162]	[11.909]
unemployment*(>10 yrs tenure)						11.173	13.143
						[11.770]	[11.456]
Terminal effects	No	No	No	Yes	Yes	Yes	Yes
Year effects	No	No	No	No	Yes	No	Yes
N	17231	15657	15657	15657	15657	15657	15657
R-squared	.0003	.0008	.0323	.0508	.0523	.0512	.0528

Notes:
(1) Robust standard errors in brackets.
(2) Errors clustered by terminal-year, adjusted for measurement error in gap term.
(3) *** = 99% level, ** = 95% level, * = 90% level.

Table V

Ordered Logit Estimates for Management-Fairness Question

Dependent Variable: response to management-fairness question

	(1)	(2)
unemployment rate	-3.196	-9.2
	[9.165]	[9.296]
gap1	1.085*	0.95
	[0.616]	[0.738]
1-5 yrs tenure	-1.334***	-1.287***
	[0.201]	[0.219]
6-10 yrs tenure	-1.760***	-1.715***
	[0.204]	[0.222]
>10 yrs tenure	-1.507***	-1.463***
	[0.195]	[0.219]
log (expected work-time)	0.138	0.353
	[0.496]	[0.502]
Terminal effects	Yes	Yes
Year effects	No	Yes
N	15657	15657
R-squared	.0337	.0348

Notes:

(1) Robust standard errors in brackets.

(2) Errors clustered by terminal-year, adjusted for measurement error in gap term.

(3) *** = 99% level, ** = 95% level, * = 90% level.

Table VI
Marginal Effects for Ordered Logits

Model:	Table 4, column 4			Table 4, column 5		
	(1)	(2)	(3)	(4)	(5)	(6)
	d[Pr(fair)]/dx	d[Pr(?)]/dx	d[Pr(unfair)]/dx	d[Pr(fair)]/dx	d[Pr(?)]/dx	d[Pr(unfair)]/dx
unemployment rate	9.289	-1.513	-7.776	2.610	-0.745	-1.865
gap1	0.243	-0.040	-0.204	0.023	-0.006	-0.016
1-5 yrs tenure	-0.135	0.022	0.113	-0.047	0.013	0.034
6-10 yrs tenure	-0.258	0.042	0.216	-0.130	0.037	0.093
>10 yrs tenure	-0.284	0.046	0.238	-0.145	0.041	0.103
log (expected work-time)	-0.122	0.020	0.102	-0.030	0.009	0.022

Note: Marginal effects evaluated at the means of the covariates

Dependent Variable: response to wage-fairness question

	(1)	(2)	(3)	(4)	(5)	(6)
gap2	0.352**	0.352**	0.832	-0.186	-0.265	
	[0.172]	[0.173]	[0.535]	[0.227]	[0.218]	
unemployment rate		2.61	6.032	58.867***	21.357	
		[5.455]	[5.521]	[10.571]	[13.158]	
male			0.032	-0.204	-0.21	-0.214
			[0.214]	[0.249]	[0.254]	[0.254]
white			0.162	0.048	0.035	0.077
			[0.120]	[0.075]	[0.076]	[0.071]
age 25-30			0.186	-0.318	-0.347	-0.257
			[0.200]	[0.200]	[0.202]	[0.183]
age 31-40			0.385	-0.296	-0.329	-0.197
			[0.262]	[0.225]	[0.224]	[0.191]
age 41-50			0.573*	-0.195	-0.235	-0.091
			[0.309]	[0.225]	[0.225]	[0.187]
age >50			1.031***	0.197	0.158	0.304
			[0.286]	[0.236]	[0.236]	[0.198]
1-5 yrs tenure			-0.432	-0.135	-0.114	-0.19
			[0.322]	[0.200]	[0.199]	[0.184]
6-10 yrs tenure			-1.028*	-0.715***	-0.702***	-0.777***
			[0.304]	[0.204]	[0.203]	[0.190]
>10 yrs tenure			-1.317***	-0.93***	-0.908***	-0.984***
			[0.304]	[0.199]	[0.199]	[0.186]
HS diploma			0.134	0.015	0.01	0.067
			[0.168]	[0.119]	[0.118]	[0.111]
Some college			0.116	-0.061	-0.068	0.005
			[0.171]	[0.123]	[0.121]	[0.116]
College degree			0.276	-0.032	-0.044	0.06
			[0.244]	[0.160]	[0.159]	[0.140]
log (standard hours)			-0.461***	-1.063**	-0.742	-0.488
			[0.159]	[0.433]	[0.524]	[0.541]
Terminal effects	No	No	No	Yes	Yes	Yes
Year Effects	No	No	No	No	Yes	Yes
N	9230	9230	9163	9163	9163	9163
Pseudo R-sqr.	.0006	.0008	.0299	.0603	.0617	.0614

Notes:
(1) Robust standard errors in brackets.
(2) Errors clustered by terminal-year, adjusted for measurement error in gap term.
(3) *** = 99% level, ** = 95% level, * = 90% level.

Table VIII
Two-Stage Least Squares Results

Dependent Variable:	First stage fairness response			Second Stage dismissal rate			Reduced Form dismissal rate		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
predicted avg. fairness response				-0.061**	-0.07***	-0.062			
				[0.025]	[0.026]	[0.094]			
unemployment rate	12.887***	12.184***	5.145**				-0.771**	-0.826**	-0.321
	[1.713]	[1.652]	[1.999]				[0.333]	[0.329]	[0.466]
gap1	0.362**	0.329*	0.049				-0.026	-0.028	-0.004
	[0.176]	[0.175]	[0.172]				[0.029]	[0.029]	[0.029]
1-5 yrs tenure	-0.19***	-0.181***	-0.096	0.02	0.02	0.014	0.032	0.034	0.02
	[0.063]	[0.061]	[0.062]	[0.025]	[0.025]	[0.025]	[0.026]	[0.026]	[0.029]
6-10 yrs tenure	-0.369***	-0.36***	-0.281***	-0.033	-0.04*	-0.013	-0.009	-0.014	0.005
	[0.065]	[0.062]	[0.063]	[0.023]	[0.023]	[0.034]	[0.028]	[0.027]	[0.027]
>10 yrs tenure	-0.415***	-0.405***	-0.321***	-0.018	-0.016	-0.025	0.008	0.013	-0.005
	[0.060]	[0.057]	[0.061]	[0.026]	[0.026]	[0.029]	[0.026]	[0.027]	[0.030]
log (expected work-time)	-0.187	-0.251*	-0.098	-0.01	-0.027	-0.022	0.001	-0.009	-0.015
	[0.120]	[0.130]	[0.121]	[0.026]	[0.028]	[0.029]	[0.026]	[0.027]	[0.027]
1997 dummy		0.042*			0.01**			0.007*	
		[0.024]			[0.004]			[0.004]	
Terminal effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year effects	No	No	Yes	No	No	Yes	No	No	Yes
N	15657	15657	15657	144	144	144	144	144	144
R-squared	.0777	.0781	.0801	.3899	.4126	.4317	.3900	.4128	.4317

Notes:
(1) Robust standard errors in brackets.
(2) Errors clustered by terminal-year, adjusted for measurement error in gap term.
(3) *** = 99% level, ** = 95% level, * = 90% level.
(4) Variables in second stage and reduced form are terminal-year averages of variables in first stage.

Figure 1: Fairness perceptions vs. wage gap, unemployment
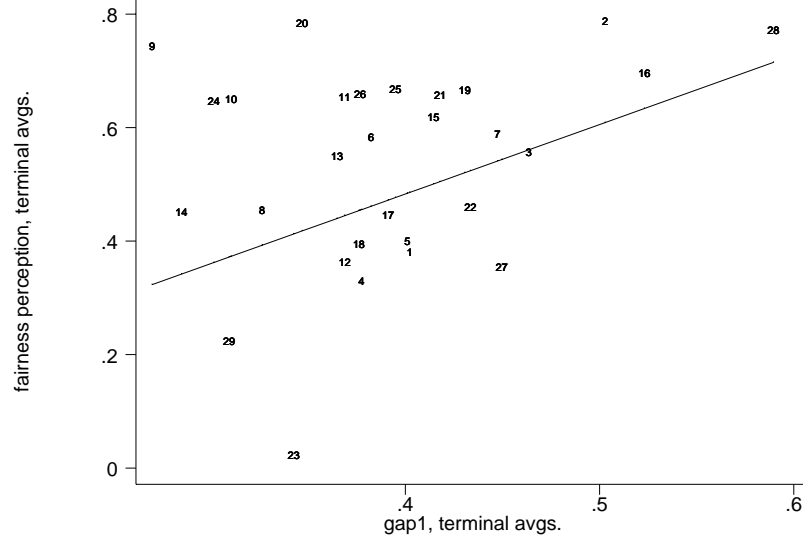
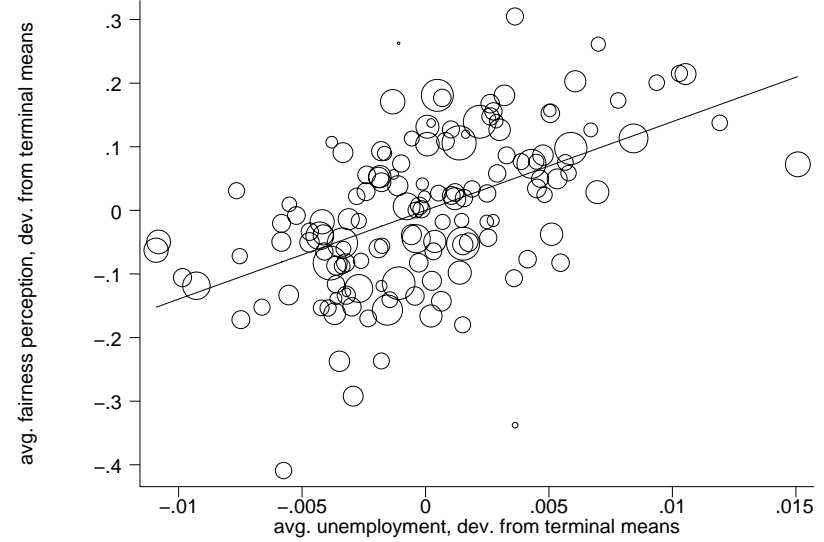# Figure 2: Median ranks vs. unemployment

Figure 2a: Median rank vs. unemp., dev. from terminal means
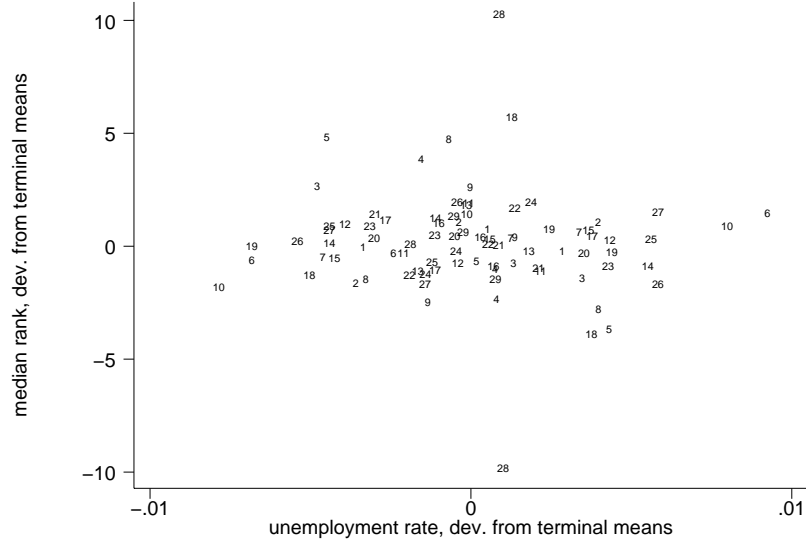

Figure 2b: Median rank vs. unemp., dev. from terminal & year means
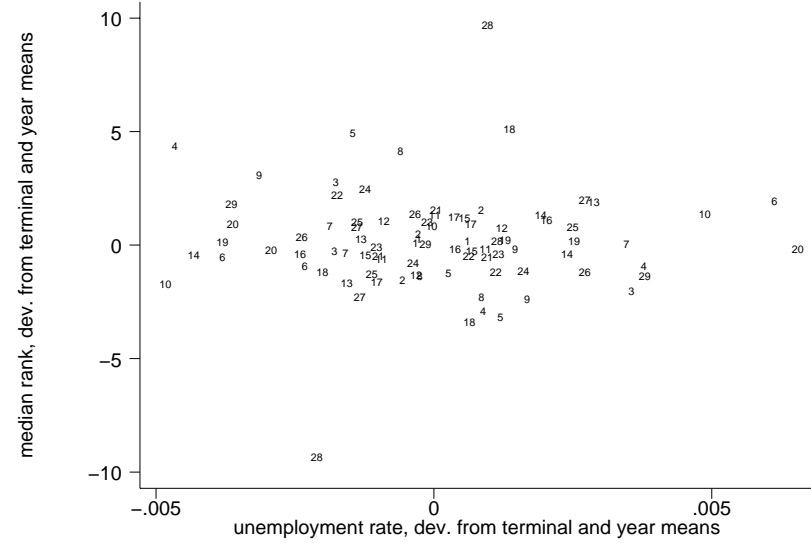

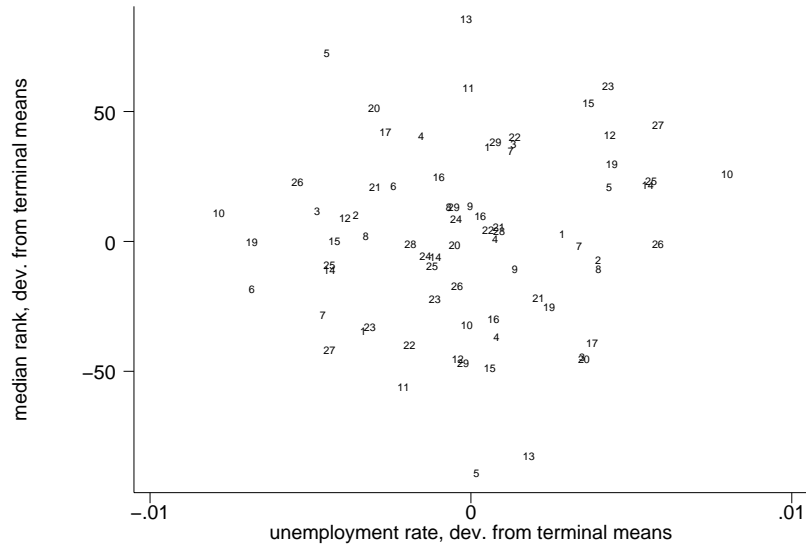Figure 2c: Med. rank of new hires vs. unemp., dev. from term. means

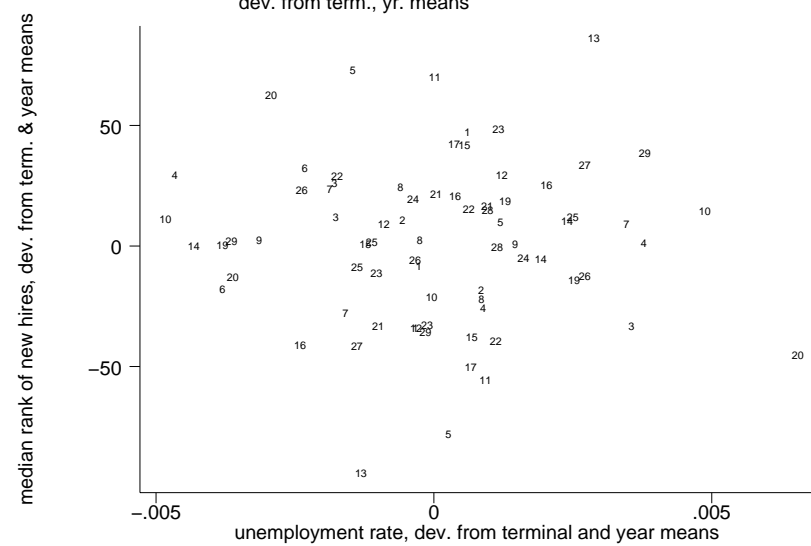Figure 2d: Med. rank of new hires vs. unemp. dev. from term., yr. means

Figure 3: Overtime hours ratio vs. unemployment
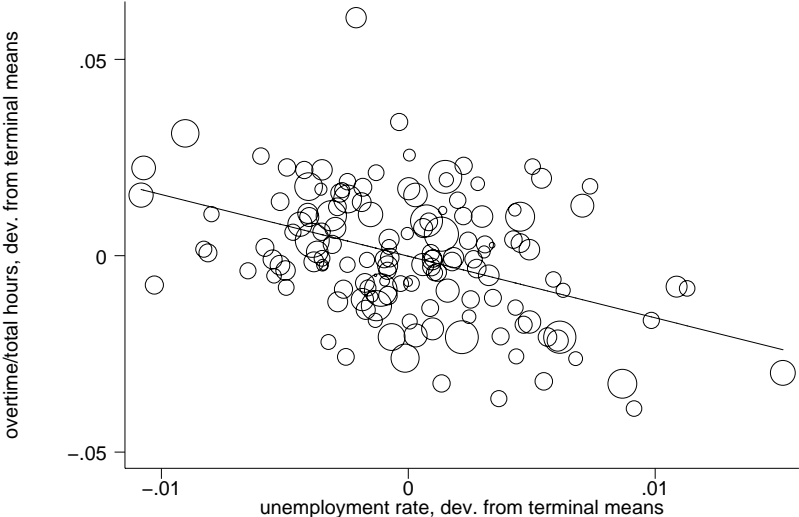

Figure 3a: overtime/total hours vs. unemp. rate
dev. from terminal means

Figure 3b: overtime/total hours vs. unemp. rate
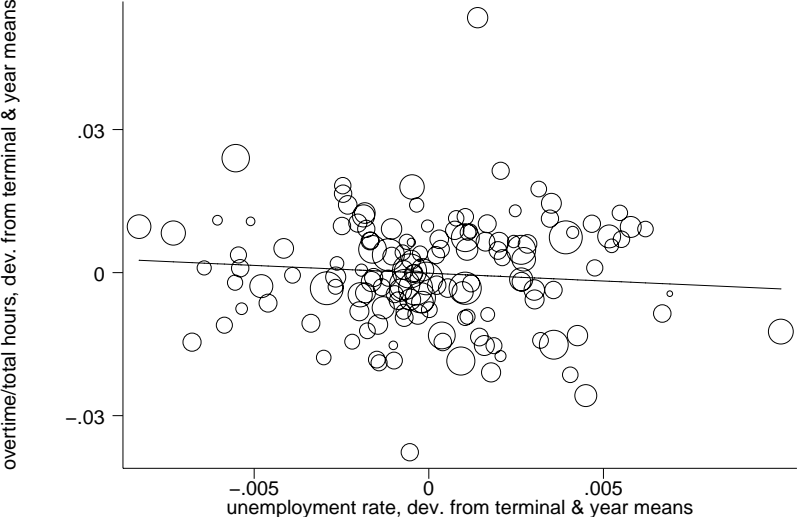dev. from terminal & year means

Figure 4: Dismissal rate vs. unemployment

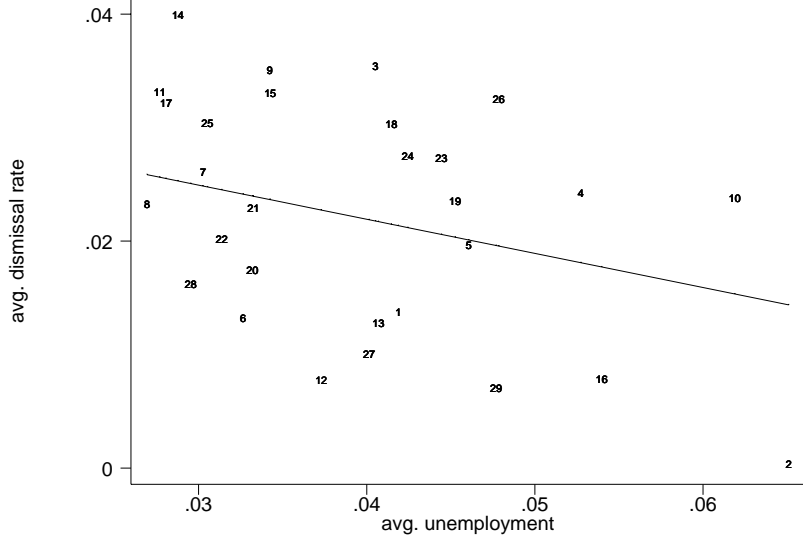Figure 4c: dismissal rate vs. unemployment, terminal averages

Figure 4d: dismissal vs. unemp, dev. from terminal averages