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Applicant Screening and Performance-Related Outcomes*

Fali Huang

Peter Cappelli

ABSTRACT

A fundamental problem faced by employers is how to elicit effort from employees. Most economic models suggest that employers meet this challenge by monitoring employees carefully to prevent shirking. But there is another option that relies on heterogeneity across employees, and that is to screen job candidates to find workers with a stronger work ethic who require less monitoring. We might therefore expect employers who screen candidates more intensively to monitor them less. Using data from a national sample of US employers, we find that employers who screen applicants more intensively for factors that should predict work ethic also monitor employees less and also make greater use of systems such as teamwork where monitoring by supervisors is more difficult. This screening is also associated with higher wages, higher employee productivity, and lower involuntary turnover rates. Screening for other attributes, such as work experiences and academic performance, does not produce these results.

JEL codes: M51, M54, J30.

Key words: *Employee Screening, Monitoring, Work Ethic, High Performance Work Practices, Principal-Agent Model.*

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1. Introduction

A central question in studies of the workplace and especially in economics is how to ensure that employees do not shirk their workplace responsibilities. Much of the research on this question focuses on economic incentive schemes that induce employees to act in the interests of their employers (see, e.g., Gibbons 1998 and Prendergast 1999). At the heart of all these agency-based models as well as related concepts like efficiency wages is the requirement that performance be monitored so that good performance can be rewarded and poor performance punished.

There is a second way to address the moral hazard problems associated with effort, however, that relies on heterogeneity across employees in their abilities, sometimes referred to in economics as “unobserved human capital.” Some job applicants are simply better workers than others. They may work harder for the same rates of pay and/or are less inclined to shirk their responsibilities, requiring less monitoring and supervision as a result. The complication for the employer is first that while the applicants know their own capabilities, it is difficult for the employer, short of hiring them, to tell. Hence the unobserved problem. Second, applicants who are not hard workers may have an incentive to pretend that they are, especially if regimes of low monitoring make it easier for them to shirk and if the jobs pay premiums of the kind that might be associated with having better workers.

The arguments used to provide solutions to moral hazard problems from this perspective often rely on self-selection: Potential applicants typically sort themselves out across opportunities such that those who lack the unobserved human capital associated with hard work do not apply for jobs that will require it while those that have it do so. The complication with these models is that they require reasonably unique and sometimes complicated reward structures to create the separating equilibrium that attracts hard workers and scares away lazy ones, such as piece rate systems or back-loaded compensation where workers have to demonstrate their performance in advance of the reward.

An alternative approach to self-selection is screening. Rather than requiring applicants to sort themselves out, the employer attempts to use proxies or other clues to identify which applicants have unobserved human capital in the form of a strong work ethic. The screening approach can be applied to a wide range of unobserved human capital beyond work ethic and does not require that the applicant even be aware of their relevant attributes (e.g., first-time

applicants have no relevant experience with which to ascertain all of their unobserved human capital). Further, screening and other forms of addressing the moral hazard problem are not mutually exclusive, and most employers make use of both screening and post-employment economic incentives (see, for example, Ichniowski, Shaw, and Prennushi 1997, Morduch 1999, and Nagin et al. 2002).

In practice, virtually all employers use some level of applicant screening. It is a fundamental part of the human resources function in most firms as well as the basis of a substantial consulting industry (see Rynes and Cable 2003 for a review). Applicant screening is fundamental to the field of industrial and organizational psychology where employee selection tests designed to identify not just skills but dispositional attributes affecting performance run the gamut of techniques: paper and pencil tests of personality attributes like conscientiousness or honesty, interviews, especially “behavioral” interviews designed to uncover prior behavior in contexts similar to the jobs in question that reveal good or poor workplace behaviors, assessment centers that place candidates in simulated, experimental work settings to see how they actually behave, references from prior employers, and “bio-data” or aspects of their work history that reveal assessments of performance. There are literally thousands of research studies examining the ability of these techniques to predict subsequent job performance.¹

Although different kinds of jobs may require different attributes, arguably the most fundamental attribute and the one that cuts across virtually all jobs can be described as work ethic, what we might think of as the ability to work hard independent of monitoring by employers or of reward. The seminal discussion of work ethic related it to social norms – the “Protestant Ethic” (see Weber 2002) - but in the context of understanding hiring and variations across applicants, it is more appropriate to think about factors that are intrinsic to an individual. While there are several attributes that relate to this behavior, a close match is with the personality construct known as "conscientiousness." This attribute has been found to be a reliable and consistent dimension of personality and is one of the “Big Five” attributes of personality (e.g., Barrick and Mount 1991). It also relates strongly to job performance across types of jobs (Schmidt and Hunter 1998). Further, it appears to have a dispositional element

¹ These studies also address the obvious challenges in making such assessments, such as data censoring issues (e.g., the worst candidates on these measures never get hired to have their performance assessed). For a guide to these techniques, see, e.g., Anderson and Herriot (1997).

that is stable across time and contexts (see, e.g., Judge and Ilies 2002 for a survey).

The research on conscientiousness provides arguably the most compelling evidence that there is something very tangible to the notion of individual work ethic, that it is an attribute of individuals and affects performance across a range of settings. To be clear, though, the basic idea that one can screen employees for dispositional attributes that affect performance is more general than the concept of conscientiousness per se. There may be individual attributes other than conscientiousness that affect job performance and may also have a dispositional character. The importance of the research on conscientiousness for our purpose is simply that it provides strong evidence that there is at least one clear attribute that could be identified by screening for work ethic.

Screening applicants involves costs, and firms therefore have to decide how much screening to do. There may well be a trade-off between screening and efforts to monitor employees: Greater use of screening can lead to a better work force that can perform at a given level with less monitoring, oversight, and performance-related incentives. An opposite approach would be to spend very little on screening and rely more on monitoring, with associated rewards and punishments, to maintain performance.

We might also expect the monitoring/screening decision to be related to aspects of the employer's production function and the choice of work systems. For example, employers with teamwork-based systems and those that rely on "empowered" employees (i.e., where employees have greater discretion to act) make monitoring by supervisors more difficult and should therefore make greater investments in screening.

Because information about work ethic is not readily or accurately available in the market (employers have to screen to find it), having a strong work ethic would not necessarily raise one's market wage. Once workers with these characteristics are hired, however, they contribute value by reducing the need for monitoring costs, saving money for employers. In order to retain these conscientious workers, employers may be motivated to pay them higher compensation through rent sharing arrangements. We might therefore expect a positive relationship between employer screening for work ethic and employee compensation. Alternatively, a regime of lower screening requires more intensive monitoring, which in turn makes it possible to hire less conscientious workers. They can be paid less than the more conscientious workers because there is no particular interest in retaining them.

More selective screening should also lead to better quality workers and therefore lower involuntary employee turnover rates or dismissals.

In the analyses below, we examine the applicant screening practices of a large sample of US employers and compare those practices first to the use of workplace practices associated with monitoring employees. We expect to find that screening and monitoring are substitutes that greater use of screening is associated with lower monitoring. We also examine the relationship between these screening practices and the use of teamwork, where we expect to find that screening and teamwork are complementary practices. Finally, we examine the effects of screening practices on various measures of employee and organizational performance. The hypotheses here are less obvious (see below), but we expect to find positive relationships between screening practices and performance outcomes.

Prior Research: The arguments below intersect with several research streams. They contribute to the existing research on the synergies among work and human resource practices (Holmstrom and Milgrom 1991; Ichniowski et al. 1997) by providing a coherent set of formal theoretical arguments and supporting empirical results on the complementarities between screening for work ethic and the use of high performance practices associated with regimes of low employee monitoring. Broadly consistent with the general findings of the literature, our results highlight the importance of screening in affecting a firm's workplace practices and performance-related outcomes, which has not yet been systematically analyzed in the literature.

Empirical research on high performance work systems focused attention on teamwork and employee involvement practices that appear to be more productive (MacDuffie 1996, Ichniowski et al. 1997). The central element of these arrangements is that employees are more involved in decision making (Cappelli and Neumark 2001), which reduces the need for supervision. But because monitoring is lower, these arrangements require employees who are more committed to the organization, hence the alternative phrase for these arrangements, high commitment work systems (see Applebaum and Batt 1994 for a survey).² Although some observers believe that work systems that increase employee empowerment make all workers more productive, an important part of these systems in practice appears to be screening employees carefully in order to identify those with unobserved human capital and dispositions

² While there are alternative pay systems that do not require monitoring of individual performance - gain-sharing or more specifically profit-sharing come to mind – such high-powered incentive schemes may also create powerful free-rider problems and they are not always feasible or even desirable.

that are consistent with the strong work ethic required in high commitment systems.

Most of the research showing how applicant screening relates to teamwork concepts is based on case studies of individual companies such as NUMMI, the joint venture between Toyota and General Motors (Keller 1989), Saturn (Kochan and Rubenstein 2000), and Southwest Airlines (Hoffer-Gittel 2002). While more systematic studies of the relationship between applicant screening and other work practices seem largely neglected (see Holzer 1999 for an important exception, Wilk and Cappelli 2003, and Pinkston 2006), descriptive findings like those above suggest that regimes with lower levels of employee monitoring should go together with practices of high investments in applicant screening; and this is consistent with our findings.

A puzzling result in the related empirical studies is that high performance practices are not associated with higher profits for firms, though they are often associated with higher wages and employee productivity (Osterman 2006, Black and Lynch 2004, Cappelli and Neumark 2001, Appelbaum, Bailey, and Berg 2000, Cappelli and Carter 2000, Freeman and Kleiner 2000). The theoretical results in our paper suggest that such a puzzling result may arise when the labor markets are highly competitive from the employers' side, in which case the increased total surplus from higher productivity goes to workers in terms of higher wages. Specifically, the profits of firms that screen for work ethic are not necessarily higher than others. They could be higher when frictions in labor markets prevent wages from being driven up to the market value of the employees. Firms may gain collectively in that the profits of *all* firms are higher when they screen more selectively or when the workforce in the economy has better work ethic, though such effects are not easily picked up in cross-sectional analysis at the level of individual firms.

These arguments also add to the recent research in labor economics that demonstrates the large effects of non-cognitive skills on individual earnings (Heckman 2000, Bowles, Gintis, and Osborne 2001, Hamilton, Nickerson, and Owan 2001, Persico, Postlewaite, and Silverman 2004). Here the contribution is to show how work ethic, as aspect of non-cognitive skills, affects firm-level performances and how workplaces are structured.

Model and Hypotheses:

The Appendix develops a formal model based on a simple principal-agent framework that identifies how we expect employers to make screening decisions. Several theoretical conclusions that we test empirically below come from that model. The first result is intuitive and suggests that there should be some substitution between the use of screening and monitoring. Employees with a stronger work ethic require less explicit monitoring and incentive payment because their intrinsic motivation discourages shirking. When the cost of screening is not too high, principals may find it beneficial to screen agents and hire only those perceived to have better work ethic in order to lower the monitoring cost. That is, principals can substitute screening for monitoring to take advantage of an agent's intrinsic motivation.

The second result may seem counter-intuitive: Employers should pay employees with a stronger work ethic more despite the fact that they need lower extrinsic incentives to motivate them. In a typical principal-agent model (for an example see Alger and Renault 2007), employers pay such workers less. The problem in such an argument is that it ignores the competition among employers for talent and hence may not be an equilibrium result. Competition among employers would bid up the basic wage for such employees and hence their total compensation in equilibrium. In other words, to attract and keep cooperative type agents to work for them, highly selective principals must provide a generous basic wage b^* in addition to the incentive pay w^* .

Such a compensation package, however, is even more attractive to selfish agents, who thus also prefer to work for more selective principals. Since self-selection does not work in this context, principals have to rely on careful employee screening to separate the conscientious agents from the selfish ones, albeit imperfectly, and then choose monitoring intensities accordingly.³ In short, the competition among principals for agents with better work ethic and the adverse selection problem jointly lead to the positive correlation between more selective screening and higher wages.

The third prediction of the model is that more selective screening leads to higher productivity, since the employee hired by a more selective employer has a higher probability of

³ When the screening choices of firms are publicly observed, which is allowed in the model, another employer may observe who the good workers are at the screening firms and attempt to hire them away. The fact that screening firms pay a premium wage helps to prevent such poaching, but it is also the case that poaching costs are not trivial, especially compared to screening costs: While the latter are a one-time cost, offering even higher wages than the screening firms pay to bid away conscientious workers is a continuing cost that adds up quickly.

being a good worker. This combined with the first result that those principals who screen more monitor less implies that the involuntary turnover rates of employees are lower when the screening selectivity is higher. In other words, firms that are more selective in screening for work ethic tend to have lower involuntary employee turnover rates because their employees are less likely to be detected shirking and fired.

The last result of the model suggests that the profits of principals may not increase in their individual screening selectivity s , because the higher surplus associated with a higher s is allocated to employees through competitive labor markets in the format of higher basic wages, which are essentially a part of the rent generated by agent work ethic. This may shed light on the puzzling empirical results mentioned in the Introduction that firms adopting high performance work practices do not necessarily earn higher profits (see also Freeman and Kleiner 2000). To be sure, however, all employers may obtain higher profits when the bottom screening selectivity \underline{s} is higher (e.g. screening is less costly or the average work ethic is higher), so collectively principals do benefit from more selective screening for work ethic.

These predictions are robust to other model specifications. For example, when the conscientiousness of agents is continuously distributed, the essence of the non-shirking condition (1) is still valid in that the more conscientious agents need less monitoring. This implies firms with more selective screening processes would again match with employees that are more conscientious on average, and thus need less monitoring, have higher productivity, pay higher wages, and are less likely to detect shirking and fire agents. The same insights will still hold when each principal can hire more than one agent, when principals differ in their monitoring techniques, when the principal-agent relationship lasts for more than one period, or when the labor market is less transparent or less competitive. It may appear, for instance, that in a second period firms with less selective screening can attract workers with stronger work ethic simply by paying higher wages; this however, may not be profit-maximizing for the firms if workplace practices that determine monitoring intensities are costly to change. Labor market frictions that reduce competition among principals tend to increase the profits of principals; some of those frictional elements include the fixed costs of hiring and search, costs that reduce the attractiveness of poaching employees from firms that invest more heavily in screening.

Data Description

The main results of the model are tested using data from the 1997 National Employer

Survey (NES97), an establishment level survey of employment practices conducted by the US Bureau of Census. It is a nationally representative sample of private establishments with more than twenty employees. In terms of criteria such as representativeness, response rate, and breadth of questions about work practices and organizational characteristics, it appears to be the broadest and best data available on employer practices and, therefore, for testing our results (see Cappelli 2001 for an extensive description of the NES). Our analysis focuses exclusively on production or frontline employees in both manufacturing and non-manufacturing industries. The sampling weights are taken into consideration in all the estimation results, and correlations of random errors among firms within the same industry type are allowed. The summary statistics of relevant variables are listed in Table 1.

Measures of Screening for Work Ethic: Perhaps the most typical measure of how extensively an employer screens applicants is the number of candidates interviewed for the job opening. In NES97 data, firms on average interview about 7 candidates for each production job opening; about 90% of the firms interview less than 10 candidates, while very few (2.6%) firms interview only one candidate. We include this measure in the analysis *Candidates#*.⁴

The obvious drawback to *Candidates#* is that it may reflect screening for attributes of any kind, not just work ethic. Fortunately, the data provide other measures that allow us to assess the interest of employers in screening for specific attributes. The NES97 asks a series of questions on how the employer selects employees. The stem of the question asks the plant or office manager: “After you have established your applicant pool and obtained information about potential [production or front-line job title provided earlier by the respondent] employee,

⁴ One may be concerned that the number of candidates interviewed is also affected by how tight the labor market was in each local labor market, an omitted variable problem: Is there something about a location that both drives applicant ratios and the relevant dependent variables, especially wages? Omitting local labor market conditions, however, should only weaken the coefficient of *Candidates#*. To see this, imagine that all firms have the same screening selectivity, but for some firms the labor market was not tight so that for each job opening there are many candidates applying while for others the opposite is true; in this scenario, a higher *Candidates#* would probably lead to *lower* wages (since more workers compete for each job opening) when the tightness of labor market is *not* controlled, though it should show *no* effect on wages when the labor market condition is properly controlled. In other words, omitting labor market conditions is likely to lead to the wrong sign or at least a downward bias for the estimated effects of *Candidates#*. The same conclusion can be drawn for other regressions.

what characteristics or attributes are most critical in making your hiring decision?” The importance scale ranges from 1 to 5, indicating respectively “no value”, “some value”, “important”, “very important”, and “essential”. Respondents use this scale to assess twelve general characteristics and attributes about applicants.

The most important screening criterion reported by employers is an applicant’s attitude toward work. It has a mean of 4.61 (SD 0.63), the highest value among the twelve criteria listed. This variable seems specifically oriented toward the goal of identifying intrinsic work ethic, the unobserved human capital that would be necessary for workers to be productive in a regime of low supervision and monitoring. The limitation is that we do not know which aspects of work ethic are important to them. Because most firms report either 4 or 5 for the importance of work attitude in hiring decision, a binary version of the importance of applicant attitude, labeled *Attitude Screening*, is used as the measure of screening selectivity for work ethic. It equals one if the firm considers a job applicant’s attitude an “essential” criterion in hiring, and it equals zero otherwise (mean= 0.68; SD 0.47).

The remaining eleven criteria can be easily divided into two groups. The average importance of the following five criteria, including high-quality performance at previous job, previous full-time work experience, communication skills, previous after-school or summer work experience, and industry-based credentials, measures screening selectivity for work-related performance, labeled *Work Experience Screening* (mean=3.41; SD 0.73). In 79 percent of the firms, work experience is an important criterion in hiring production employees, but only 2 percent consider it as “essential.” The average importance of the remaining six criteria – an applicant’s education level (years completed), school reputation, high academic performance in school, course work in technical areas, course work in general subjects, and extra-curricula activities – reflect screening on academic skills, denoted by *Academic Performance Screening* (mean 2.42; SD 0.82). About 25 percent of firms consider the academic performance important in hiring production or frontline employees.

The three selectivity variables, namely, Attitude Screening, Work Experience Screening, and Academic Performance Screening are positively and significantly correlated with each other. It is important to acknowledge that these measures tell us about the importance the employers give to these attributes as opposed to measuring more directly what they are screening for. But it is not clear that the latter would necessarily be preferable:

Employers gather all kinds of information about candidates without necessarily paying much attention to all of it, and knowing what they collect would not necessarily tell us what they use, the information we have here. The differences in the importance levels exhibited by the three different selectivity variables we use suggest that firms do vary a lot in what they value about applicants.

Measuring Monitoring: The employee-supervisor ratio, sometimes known as the “span of control,” is an often-used inverse indicator of monitoring intensity (Leonard 1987, Gordon 1994); the assumption is that a lower ratio allows for closer supervision and monitoring by managers. In NES97, the *Employee-Supervisor Ratio* is measured by the average number of employees that report to each front-line supervisor, where higher ratios mean lower monitoring intensity. In the sample, the median Employee-Supervisor Ratio is 9, and most supervisors (over 98 percent) are in charge of less than or equal to 50 employees. Excluding the very few apparent statistical outliers that have more than 100 employees per supervisor, the average level of Employee-Supervisor Ratio is 13.17 with a standard deviation of 12.95.⁵

Teamwork: The other implication of our arguments above is that employers who make greater use of systems of work that rely on lower levels of monitoring should make greater use of screening for work ethic. “High performance work systems,” which make greater use of employee involvement are perhaps the best example of a low-monitoring system of work organization. Self-managed teams, where the team takes over much of the traditional responsibilities of supervisors, may be the most intensive application of a low monitoring, high

⁵ Supervisory ratios have some limitations as a proxy for monitoring because monitoring may take place through ways other than one's immediate supervisor and supervisors may perform tasks in addition to monitoring. For example, about twenty percent of supervisors' time is devoted to providing informal training (see 1994 NES survey); the supervisors may also perform some of the tasks that their supervisees perform, especially if the supervisor operates in the mode of a lead worker. If the supervisory ratio captures in part efforts to train and instruct the workforce and perform some work tasks, it may be driven in part by attributes of the organization and the nature of the tasks being performed. To address these omitted variable concerns, we include a number of control variables including the length of time for a new hire to reach job proficiency and the average years of schooling for production employees as well as the two screening selectivity variables on work experiences and academic performance.

performance work system.⁶ The NES97 survey explicitly describes self-managed teams as having “some degree of responsibility and discretion over such decisions as methods of work, task schedules, assignment of members to different tasks, and feedback about group performance.” About 34 percent firms adopt self-managed teams; for these firms, on average about 45 percent of their employees are participating in teams, while 24 percent of these firms involve all their production employees in teams. We use the percentage of production employees involved in self-managed teams, denoted by *Teamwork* (mean 15.55 SD 30.66), as a measure of a low-monitoring work system. The argument about the relationship between *Teamwork* and screening for work ethic is associative rather than causal: It could be that employers who do such screening find it easier to introduce self-managed teams or that employers who use such teams need to screen for work ethic. As expected, *Teamwork* is positively and significantly correlated with Employee-Supervisor Ratio.

Other Dependent Variables: As noted above, we expect relationships between screening for work ethic and other organization-level outcomes. One of these is wage rates. Wages are measured by the log of the average annual pay of production employees (mean \$22894 SD \$13235). The proportion of various types of employee benefits contributed by the firm is controlled in the wage regression, where on average firms provide six out of the ten types of benefits to their employees, among them 75 percent firms provide five or more types of employee benefits.

Employee productivity is measured by the variable *Relative Productivity*, which equals one if the employer considers its employees’ productivity to be higher than its major competitors and zero if not. About 50 percent firms in the unweighted sample consider their employees as more productive than their major competitors, while this figure is slightly higher in the weighted sample, where the variable *Relative Productivity* has a mean 0.57 and standard deviation 0.50. So it seems to be a reliable measure of relative employee productivity across firms. It is also a commonly used measure of productivity across industries in related literature (Bryson and Freeman 2008, Heywood et al. 2008). We recognize the inherent weakness associated with using self-reported measures of performance, which tend to be affected by self-

⁶ Researchers who study teamwork argue that teams may have other positive effects on performance, such as reducing coordination problems or improving knowledge sharing. Whether these benefits are in addition to the reduction in supervisory and monitoring costs or should be considered part of them is an open question.

serving, upward biases. For the purpose of understanding variations across establishments, however, an upward bias matters mainly if it varies across establishments, and we have no reason to think that it should or, if so, how it would vary.⁷

The variable *Involuntary Turnover* equals the percentage of permanent workforce in the firm that left involuntarily (e.g. fired or laid off) in the past year. The involuntary turnover rate is below 10 percent in over 83 percent firms, while in more than 97 percent firms the rate is below 30 percent. The variable *Involuntary Turnover* has a mean of 6.36 and standard deviation 10.25. We might think of the relationship with involuntary turnover as something of a reliability check: Screening applicants should lead to fewer hiring mistakes.

The fact that our data are cross-sectional limits the ability to make causal arguments, but as noted above, most of the arguments are associative rather than causal: The inverse relationship between screening for work ethic and monitoring and teamwork are associative. The relationship with wages could be associative as well: higher wage employers find it useful to screen for work ethic, in part because higher wages attract more heterogeneous applicants who have to be sorted out. The other arguments are more explicitly causal as screening for work ethic is seen as driving aspects of firm performance. It is not obvious why better performing operations or those with lower turnover would find it more useful to screen for work ethic than other firms (better performers may have more resources to screen but worse performers may have more need), but our analyses cannot rule out that interpretation.

Many questions in the NES97 survey are asked only for front-line production employees, which greatly narrows the range of possible jobs we can examine, but that helps control for exogenous sources of variation, albeit at the expense of generalizability. Detailed industry and size dummies are also used to control for potential variations in the important aspects of production functions and in the costs or ability to screen and monitor employees (e.g., scale economies). Other potentially relevant factors for which we control include the average years of schooling for production employees, their weekly working hours, the usage of computers on the job by supervisors and employees, the length of time for a new hire to reach job proficiency, ratios of women and minorities among permanent employees, and union

⁷ Bryson and Freeman (2008) observe that “Most British studies of the effect of modes of compensation on productivity have used questions of this form in their analyses” (pp. 18) and in their data from the UK this subjective productivity measure yields similar results as other objective financial measures.

strength. These variables are used as controls to account for the remaining elements in the model that may influence a firm's monitoring and screening choices as well as wage levels, employee productivity and turnover rates. Due to missing values, the sample sizes vary across regression models.

Results: Estimation results on the relationship between *Employee-Supervisor Ratio*, a measure of the inverse of monitoring intensity, and screening selectivity for work ethic are presented in Table 2. Firms that screen more for work ethic should hire better agents who need less monitoring to make the required effort. Because a higher employee-supervisor ratio implies a lower monitoring intensity, the coefficient of screening selectivity for work ethic should be positive in the regression, and this is indeed the case. The estimated coefficients of *Candidates#*, the basic measure of screening intensity, are positive and statistically significant when all the other screening selectivity variables are not included. Moreover, the estimated coefficients of *Attitude Screening*, the cleaner measure of screening selectivity in work ethic, are positive and significant above 5% level across the board even when controlling for *Candidates#*, the measure of overall screening. *Work Experience Screening* and *Academic Performance Screening*, in contrast, are never statistically significant, and the coefficients of *Academic Performance Screening* are negative.

Based on estimates under the most comprehensive specification in Column (3), treating work attitude as essential in hiring employees as opposed to anything less than essential enables its typical frontline manager to supervise about 2 more employees on average, which is about 14% ($=1.767/12.72$) of a standard deviation of *Employee-Supervisor Ratio* in the regression sample and equivalent to the effect of interviewing about 14 ($=1.767/.123$) more job candidates for each production job opening (over 2.5 standard deviations' increase in *Candidates#*). This suggests that the tradeoff between the intensities of screening for work ethic and monitoring can be quite substantial.

Table 3 shows results of a similar set of regressions where *Teamwork* is the dependent variable. The estimation results are similar to those in Table 2. In specific, the coefficients of *Attitude Screening* are both positive and significant at .01 level across all specifications, while those of *Candidates#* and *Work Experience Screening* are positive but insignificant; in contrast, the coefficients of *Academic Performance Screening* are still negative and insignificant. Based on the estimates in Column (3) of Table 3, treating work attitude as essential in hiring

employees as opposed to anything less than essential is associated with an average increase of 5.842 percentage of employees involved in teamwork, which is about 19% of a standard deviation of *Teamwork* and equivalent to the effect of interviewing about 18 more job candidates for each production job opening (more than three standard deviations' increase in *Candidates#*).

These results suggest that there is a strong synergy between screening employees for work ethic and the use of low-monitoring work practices that make use of such behavior. In other words, these human resource practices are complementary. More generally, the results are consistent with the notion that there may be a trade-off between management approaches that rely on conscientious workers and empowered working arrangements versus those that rely on high levels of monitoring.

Estimation results examining the relationship between wages and screening selectivity are presented in Table 4. Because principals with a more selective screening process offer higher wages to their agents in order to retain them, we predict positive coefficients for screening for work ethic. This prediction is well supported by our estimation results, where the coefficients of *Work Attitude Screening* are always positive and significant across all specifications. Interestingly, the coefficients of *Candidates#*, though positive, are never significant. The estimated effects of *Work Experience Screening* are always positive and significant, while those of *Academic Screening* are also significant but negative across various specifications, which may be justifiable because academic performance is presumably less important for production and frontline workers than their work attitude and working experiences. The reverse causation argument suggests that higher wage employers should screen more intensively to sort out the greater number of candidates associated with offering higher wages and perhaps also to ensure more productive employees. But if that was the explanation, we would expect to see screening of all types being related to wages, and we do not.

When Employee-Supervisor Ratio and *Teamwork* are added to the wage regression in Columns (5), their estimated effects are insignificant and hardly affect the coefficients of the three screening variables. The effect of screening for work ethic on wages therefore does not seem to be attributable to an indirect relationship with lower levels of monitoring or *Teamwork*. These results are consistent with our theoretical arguments in that the association between

lower monitoring and higher wages is through screening for better employees, especially those with strong work ethic as well as working experiences. Based on the estimates in Column (4) of Table 4, treating work ethic as an essential criterion in hiring employees is associated with an increase of 11% ($=0.061/0.54$) of a standard deviation of log wage, which is equivalent to US\$1520.57 increase of annual pay or 77% of the average month salary of production/frontline employees.

Table 5 contains logit estimation of the relationship between the relative productivity of a firm's employees as compared to its major competitors and screening selectivity. Because employers who screen more are more likely to have better employees, the theoretic model predicts a positive effect of screening selectivity for work ethic on employee productivity. The coefficients of *Candidates#* are positive though never significant, while those of Attitude Screening are always positive and significant. The estimated effects of the other two screening variables on work experiences and academic performance are also positive, but only those of academic performance are significant. The results are similar if either a probit model or a linear probability model is used. The estimates in Column (3) of Table 5 suggests that treating work attitude as an essential criterion in hiring employees is associated with 37% ($=0.185/0.50$) of a standard deviation of Relative Productivity.

Table 6 contains estimation results on the relationship between the involuntary turnover rate of a firm's employees and screening for work ethic. As in Table 5, *Candidates#* is never significant across all specifications in Table 6 while the coefficients of Attitude Screening are always significant and negative. Screening on both work experiences and academic performance has insignificant effects, though with different signs. Overall, the results suggest that screening selectivity for work ethic indeed reduces the involuntary turnover rate of employees. Based on the estimates in Column (3) of Table 6, treating work attitude as essential in hiring employees as opposed to anything less than essential is associated with a reduction of the Involuntary Turnover Rate of 17% ($=1.519/9.04$) of a standard deviation.

Conclusions

We find that paying more attention to positive workplace attitudes, what we describe as work ethic, is related to less monitoring and greater use of work practices that require cooperative employee behavior. It is also associated with higher employee productivity, lower involuntary turnover rates, and higher wages. The underlying intuition is that firms more

selective in screening job candidates for work ethic are more likely to hire conscientious workers who are willing to work hard with less monitoring. These employers can then make use of practices that involve workers more and monitor them less; reduced monitoring costs allow the firm to share rents in the form of higher wages in order to attract and retain these good workers. Because employees with stronger work ethic are less likely to shirk, their productivity is higher relative to other firms and their involuntary turnover rates are lower. We do not find these relations for other screening for other attributes or even for more selective hiring associated with more intensive overall screening of applicants.

An important caveat to these results is that an applicant's work attitudes is an imprecise concept, especially for behavioral scientists who recognize that there are many different types of attitudes that can contribute to reduced needs for monitoring and better performance. We cannot establish what the relevant attitudes are that are being screened. All we can capture here is that paying attention to the general category of work attitudes among job applicants produces the results described above. But the results suggest how applicant screening fits in with other practices and outcomes as an important factor in creating the overall work system.

In future research, it would be interesting to examine these relationships in more detail. For example, when the dismissal cost in the labor market is made higher by labor policies, we might expect to see firms screen job candidates more carefully as monitoring and dismissal are more expensive; exogenous changes in work organization that create more job autonomy, which makes monitoring more difficult, may lead to more screening and less monitoring. It would also be interesting to see to what extent training, socialization, and other practices designed to improve employee behavior affect the balance between monitoring and screening practices.

Table 1: Summary Statistics (weighted), NES97

Variable Names	Mean (SD)	Obs.
<i>1. Screening Selectivity for Work Ethic:</i>		
Candidates# interviewed for each production job opening	6.62 (5.90)	2557
Attitude Screening	.68 (0.47)	2746
<i>Two Other Screening Variables:</i>		
Work Experiences Screening	3.55 (0.69)	2739
Academic Performance Screening	2.42 (0.82)	2734
<i>2. Monitoring Intensity:</i>		
Employee-Supervisor Ratio On average, how many employees report to each front-line supervisor?	13.17 (12.95)	2750
Teamwork: What percent of non-managerial and non-supervisory employees are currently involved in self-managed teams?	15.55 (30.66)	2928
3. Log Wage: the log of average annual pay for full-time production employees	9.89 (0.55)	2495
4. Relative Productivity: =1 if higher than major competitors and 0 if not	.57 (0.50)	2804
5. Involuntary Turnover: percentage of permanent workforce left involuntarily	6.36 (10.25)	2719
<i>6. Control Variables:</i>		
Schooling for production employees	12.46 (1.35)	2663
Working hours per week for the production employees	39.39 (7.76)	2740
Computer usage (supervisors): percent using computers in their jobs	76.55 (36.35)	2732
Computer usage (production employees) : percent using computers in their jobs	52.08 (41.97)	2699
Union ratio: percent of non-managerial, non-supervisory employees covered by a collective-bargaining agreement	6.96 (23.39)	2943
Months to reach job proficiency for a typical new hire	6.85 (12.65)	2696
Ratio of women: percent among permanent employees	46.08 (29.61)	2883
Minority ratio: percent among permanent employees	24.63 (26.88)	2829
Average employee benefits The establishment contributes toward any of the following employee benefits (1 if yes, 0 if no): Pension plan, Severance plan, Medical or health insurance, Dental care benefits, Child care benefits, Family leave, Life insurance, Sick pay, Paid vacation/holidays, Stock options or profit sharing.	5.8 (2.4)	2855
Size of the Establishment (number of employees)		
20-49	0.60 (0.49)	
50-99	0.22 (0.41)	
100-249	0.13 (0.34)	3081
250-999	0.04 (0.20)	
1000 or more	0.01 (0.08)	
Manufacturing industry	0.18 (0.38)	3081
21 industry dummies	-	3081

Table 2: Employee-Supervisor Ratio and Screening Selectivity

	Employee-Supervisor Ratio				
	OLS				
	(1)	(2)	(3)	(4)	(5)
Number of Candidates Interviewed for Each Production Job Opening	.146** (.064)	.135* (.066)	.123 (.081)		
Attitude Screening		1.908** (.760)	1.767** (.698)	2.024** (.751)	1.848** (.682)
Work Experience Screening			1.046 (1.232)		1.148 (1.231)
Academic Performance Screening			-.312 (.519)		-.183 (.507)
Number of Observations	1960	1960	1960	1960	1960
R-squared	.175	.179	.182	.176	.179

Notes: Standard deviations are in the parentheses. *** Statistically significant at the .01 level; ** at the .05 level; * at the .10 level. The data are from 1997 National Employer Survey (NES97) in the US. The Employee-supervisor ratio measures the inverse of monitoring intensity. The screening selectivity for work ethic is measured by Candidates# and Attitude Screening. The other control variables include the average years of schooling of production employees and their working hours per week, computer usage by supervisors and production employees, union representation, months to reach job proficiency for a typical new hire, the ratios of minority and women in the permanent employees as well as five size dummies and twenty-one industry dummies.

Table 3: Teamwork and Screening Selectivity

	Percentage of Employees in Self-Managed Teams				
	OLS				
	(1)	(2)	(3)	(4)	(5)
Number of Candidates Interviewed for Each Production Job Opening	.404 (.319)	.371 (.307)	.331 (.273)		
Attitude Screening		6.361*** (2.158)	5.842*** (2.062)	6.648*** (2.312)	6.013*** (2.140)
Work Experience Screening			3.395 (2.399)		3.667 (2.545)
Academic Performance Screening			-1.034 (.628)		-.728 (.620)
Number of Observations	2020	2020	2020	2020	2020
R-squared	.134	.142	.145	.138	.142

Notes: Standard deviations are in the parentheses. *** Statistically significant at the .01 level; ** at the .05 level; * at the .10 level. The data are from 1997 National Employer Survey (NES97) in the US. The screening selectivity for work ethic is measured by Candidates# and Attitude Screening. The other control variables include the average years of schooling of production employees and their working hours per week, computer usage by supervisors and production employees, union representation, months to reach job proficiency for a typical new hire, the ratios of minority and women in the permanent employees as well as five size dummies and twenty-one industry dummies.

Table 4: Wages and Screening Selectivity

	Log Average Annual Pay of Production Employees				
	OLS				
	(1)	(2)	(3)	(4)	(5)
Number of Candidates Interviewed for Each Production Job Opening	.001 (.003)	.0008 (.003)	.0006 (.003)	.0012 (.004)	.0011 (.004)
Attitude Screening		.068*** (.027)	.062** (.028)	.061** (.029)	.058* (.032)
Work Experience Screening			.042** (.017)	.052*** (.017)	.057*** (.019)
Academic Performance Screening			-.021* (.011)	-.033** (.013)	-.034** (.012)
Employee-supervisor ratio					-.0009 (.0006)
Teamwork					.0001 (.0003)
Average Employee Benefits				.396*** (.044)	.422*** (.049)
Observations	1930	1930	1930	1873	1803
R-squared	.692	.695	.697	.697	.702

Notes: Standard deviations are in the parentheses. *** Statistically significant at the .01 level; ** at the .05 level; * at the .10 level. The data are from 1997 National Employer Survey (NES97) in the US. The dependent variable is log wage. The screening selectivity for work ethic is measured by Candidates# and Attitude Screening. The other control variables include the average years of schooling of production employees and their working hours per week, computer usage by supervisors and production employees, union representation, months to reach job proficiency for a typical new hire, the ratios of minority and women in the permanent employees as well as five size dummies and twenty-one industry dummies.

Table 5: Relative Productivity and Screening Selectivity

	Employee Productivity Higher than Major competitors				
	Logit				
	(1)	(2)	(3)	(4)	(5)
Number of Candidates Interviewed for Each Production Job Opening	.036 (.037)	.036 (.037)	.018 (.024)		
Attitude Screening		.224** (.111)	.185* (.106)	.239** (.106)	.189* (.106)
Work Experience Screening			.096 (.141)		.111 (.128)
Academic Performance Screening			.625** (.300)		.639** (.314)
Number of Observations	1974	1974	1974	1974	1974
Pseudo R-squared	.101	.102	.138	.097	.137

Notes: Standard deviations are in the parentheses. ***Statistically significant at the .01 level; ** at the .05 level; * at the .10 level. The data are from 1997 National Employer Survey (NES97) in the US. The screening selectivity for work ethic is measured by Candidates# and Attitude Screening. The other control variables include the average years of schooling of production employees and their working hours per week, computer usage by supervisors and production employees, union representation, months to reach job proficiency for a typical new hire, the ratios of minority and women in the permanent employees as well as five size dummies and twenty-one industry dummies.

Table 6: Involuntary Turnover Rate and Screening Selectivity

	Percentage of Workforce Left Involuntary in Past Year				
	OLS				
	(1)	(2)	(3)	(4)	(5)
Number of Candidates Interviewed for Each Production Job Opening	-.0110 (.035)	-.0047 (.036)	-.0005 (.033)		
Attitude Screening		- 1.589* (.837)	- 1.519* (.790)	- 1.592* (.836)	- 1.519* (.790)
Work Experience Screening			-.609 (.963)		-.609 (.958)
Academic Performance Screening			.313 (.908)		.312 (.915)
Number of Observations	1989	1989	1989	1989	1989
R-squared	.092	.098	.099	.097	.099

Notes: Standard deviations are in the parentheses. ***statistically significant at the .01 level; ** at the .05 level; * at the .10 level. The data are from 1997 National Employer Survey (NES97) in the US. The dependent variable is log wage. The screening selectivity of work ethic is measured by Candidates# and Attitude Screening. The other control variables include the average years of schooling of production employees and their working hours per week, computer usage by supervisors and production employees, union representation, months to reach job proficiency for a typical new hire, the ratios of minority and women in the permanent employees as well as five size dummies and twenty-one industry dummies.

Appendix:

A Principal-Agent Model with Screening and Monitoring

Technology. In our model, a principal hires an agent to work on their behalf. The outcome of their work effort depends on the nature of the agent but is otherwise stochastic. If the agent makes the appropriate effort and completes the task as specified, the principal gets a return h with probability q_h and 0 with probability $1 - q_h$, where $h > 0$ and $q_h \in (0, 1)$. If the agent shirks, the probability of getting h is $q_l \in [0, 1)$, where $q_l < q_h$. The cost of making the required effort is c , while shirking incurs no cost to the agent. The alternative return for principals is z . We assume $hq_h - c > z \geq hq_l$ so that exerting effort is the social optimal choice, while hiring an agent who is sure to shirk is worse than not hiring.

There is a limited liability constraint so that a bond cannot be imposed on agents. To reduce shirking, a principal may use screening to identify good agents and monitoring technologies to ensure appropriate effort. The choice about screening versus monitoring is the focus of our model.

Agent Type. Agents are heterogeneous in their levels of work ethic, which we see as a disposition to work hard and cooperate with others in pursuing the employer's goals. More specifically, an agent has a work ethic $e \in \{0, \alpha\}$ that measures the amount of discomfort or guilt he feels if he shirks, whether caught or not by the principal. He is called a *cooperative type* if $e = \alpha > 0$, or a *selfish type* if $e = 0$. The proportion of cooperative type agents in the population is ρ .

A person's work ethic may be regarded as equivalent to non-cognitive skills in the context of recent research (e.g., Heckman 2000, Bowles et al. 2001), and similar concepts are adopted in studies of social preferences and trust (e.g., Fehr and Schmidt 1999, Rob and Zemsky 2002, Casadesus-Masanell 2004).

Screening. A principal with a screening selectivity r correctly detects the work ethic of an agent with probability r , and she makes a likely misjudgment with probability $1 - r$, where $r \in (0.5, 1]$. A screening principal hires the first job applicant who is perceived to be of cooperative type and rejects others. This screening scheme implies that a cooperative agent has a probability r of being hired after screened, while a selfish agent has a probability $1 - r$ to

pass the screening and be hired. So conditional on being hired by a screening principal, the probability of an agent being a cooperative type is

$$s \equiv \frac{\rho r}{\rho r + (1-r)(1-\rho)}.$$

Note that s is a positive transformation of r and thus it also indicates the screening selectivity of a principal. The screening cost is denoted by $\sigma(s, k_s)$, where $\sigma_i > 0$ and $\sigma_{ij} > 0$ for $i, j = 1, 2$, while k_s is a parameter representing the cost of using screening technologies such as conducting interviews and tests. Principals are heterogeneous in their screening cost parameter k_s , which is not too high so that all principals will conduct some screening. The lowest screening selectivity among principals is denoted as \underline{s} .

Monitoring. All principals have access to the same monitoring technologies. A principal chooses a monitoring intensity $m \in [0, 1]$ so that an agent who shirks is caught by the principal with a probability $p(m)$, where $p' > 0$, $p'' < 0$, and $\lim_{m \rightarrow +\infty} p(m) = 1$. The total monitoring cost is mk_m , where k_m measures the unit cost of using monitoring technologies such as operating video cameras in the workplace or hiring additional supervisors.

Wages. An agent is paid an incentive wage w that has to be forsaken when shirking is confirmed. The incentive wage w and the monitoring intensity m are both extrinsic incentives provided by the principal, and their substitution relationship has already been extensively studied in the literature (see, e.g., Dickens et al. 1989). Because our focus is on the relationship between screening and monitoring, we make the simplifying assumption that w is not contingent on the two outcomes h and 0 , which is reasonable if the outcomes are not verifiable by the court and hence are not contractible in a legal sense; relaxing such an assumption may increase the effect of the incentive wage in deterring shirking, but does not change our main results. The compensation for an agent may contain another component, denoted as the basic wage b , to keep the agent from being poached by other principals. So the total income of the agent is $I = b + w$, the sum of the basic wage and the incentive pay.

Utility Function. Agents are risk neutral and their reservation utility is zero. The utility of an agent with a work ethic e is $w - c + b$ if he makes the required effort, and $w(1 - p(m)) - e + b$ if he shirks. It is easy to check that, in any given match, an agent will not

shirk if the sum of his intrinsic motivation e and the external punishment $p(m)w$ imposed by the principal is not smaller than the cost of effort c :

$$(1) \quad e + p(m)w \geq c.$$

In other words, the more conscientious an agent is, the less likely he will shirk given the same incentive package. For an agent whose work ethic is so high that $e \geq c$, no monitoring is needed at all. To focus on the more common case where a typical cooperative agent also needs some explicit incentives to exert effort, we assume $e < c$.

Time Line and the Matching Process. The time line of this game is as follows. Principals first announce their screening intensity s , the monitoring intensity m , the incentive wage w , and the basic wage b for agents that are hired. Agents then decide where to apply for jobs. If an agent is indifferent among many principals, he randomly selects one; if multiple candidates apply for one job opening, they are randomly queued for screening and possible hiring: A screening principal screens job candidates, hires the first one perceived to be of cooperative type and rejects others. An agent that is either rejected or has not been screened may queue again waiting for the screening of another principal that is still hiring. Principals do not observe the matching history of an agent; they can, however, observe who is hired by which principal and poach the agent already hired with a cost denoted by T , which presumably consists of a contract-breaking fee that has to be paid by the agent and other related costs; $T \geq \sigma(s, k_s)$ is assumed to ensure the existence of screening in equilibrium, which can be quite reasonable if the agent who is hired after costly screening but then decides to break the contract is required to compensate the principal at least for the relevant screening cost. Without loss of much generality, we assume $T = \sigma(s, k_s)$. The matching process stops once all principals have hired an agent. After matching is finished, the agent is paid the basic wage b and then chooses whether to make effort or shirk; principals monitor agents, pay the incentive wage w if no shirking is found, while pay nothing and fire the agent if shirking is detected. The game then ends.

Strategies. A principal's strategy includes the screening intensity s , the incentive package (m, w, b) and whether or not to poach agents hired by other principals. An agent's strategy includes where to apply for jobs and whether to shirk or not once in a match.

Equilibrium. The competitive equilibrium is reached when principals maximize profits,

agents maximize utilities, and there is no partner-changing once in a match. Depending on the parameter values, there are different equilibrium results. To focus on the more interesting and realistic cases, we assume that the screening and monitoring costs are not too high so that all principals in equilibrium choose to screen job applicants and also monitor their employees. Specifically, we assume $k_s \leq hq_h - hq_l - c$ holds. The equilibrium results are described in the following proposition.

Proposition 1. *In the equilibrium, a principal chooses the optimal screening selectivity s^* and the optimal incentive package (m^*, w^*, b^*) such that $(1-s^*)p'(m^*)c - k_m = 0$, $w^* = c$, $h(q_h - q_l) - p(m^*)c - \sigma_1(s^*, k_s) = 0$, and $b^* = Q_s^* - Q^*$, where $\partial s^* / \partial k_s < 0$, $Q^* \equiv Q_s^*|_{s=s^*}$, and $Q_s^* \equiv s^*hq_h + (1-s^*)(hq_l + p(m^*)c) - c - m^*k_m - \sigma(s^*, k_s)$. Both types of agents prefer to work for more selective principals.*

(i) $\partial m^* / \partial s < 0$: *The optimal monitoring intensity decreases in s .*

(ii) $\partial (w^* + b^*) / \partial s \geq 0$: *The total incomes of both types of agents increase in s .*

(iii) *Cooperative agents make the required effort while selfish agents shirk if hired, and so the average productivity $shq_h + (1-s)hq_l$ increases in s .*

(iv) *The profits of principals with more selective screening are at least as high as those of less selective principals, though not necessarily higher.*

A formal proof of the above is available in an electronic appendix. .

This proposition suggests that *firms that screen job applicants more selectively for work ethic tend to (i) monitor less, (ii) pay higher wages, (iii) have higher productivity, and finally, (iv) earn profits not lower than others but not necessarily higher.*

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