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Economic Determinants of Applicant Screening Practices: Analysis of the Korean Human Capital Corporate Panel

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Abstract

This study reviews employers' existing recruiting practices and the environment in which these are deployed, and estimates their effect on the employers' and workers' outcomes. The Korean Human Capital Corporate Panel spanning years 2005–2013 is used to take stock of employers' screening of applicants' personal characteristics, and regressions with fixed effects link the screening practices to firms' skill needs, skill supply and labor-market constraints. Institutional and market constraints on employers' conduct are found to affect screening practices more than firms' skill needs. The existence of HR departments, worker unionization, and applicant pool size have systematic effects. Employers' skill needs and screening practices, in turn, affect the female share among new hires. HR departments, personnel committees on boards, and foreign management put a constraint on firms' hiring discrimination, effectively supporting women's cause.

Keywords: Recruitment, Applicant Screening, Employment Discrimination, Human Capital Corporate Panel

1. INTRODUCTION

It is a commonplace practice for East Asian employers to use an extensive job-applicant screening process, and to screen applicants' detailed personal characteristics. Firms survey applicants' family background, social and financial status, health, appearance, and various personal hobbies, affiliations and beliefs. Screening on these characteristics is inappropriate because it affects firms' treatment of applicants; the factors are not directly related to productivity; and they are correlated with applicants' characteristics protected by law. Such screening violates recruiting standards – legality of recruiting practices and information collected; procedural justice and objectivity; consistency and unbiasedness across decision-makers and subjects; review by multiple professional decision-makers; content-fairness and relevance to applicants' merit; job-relatedness; non-invasiveness; falsification-proneness; and outcome-fairness (Truxillo et al. 2004). Some characteristics screened by employers are banned from consideration by Korean laws, and factors unrelated to productivity are actively discouraged by National Human Rights Commission and Ministry of Employment and Labor guidelines (NHRC, 2003; MOEL, 2007).

This study focuses on Korean employers' choice over the screening of job applicants, and the ranking of applicants' personal characteristics among the criteria in the selection process. Economic determinants of firms' recruiting practices, and consequences of those practices for applicants' outcomes are assessed. The study uses the count of stages in firms' recruiting process to indicate the extent of applicant screening. The ranking of applicants' birthplace,

appearance and school name among criteria for selecting applicants is used to gauge firms' reliance on applicants' personal characteristics. Screening based on personal factors is thought to be gender-biased and to affect particularly female applicants, who are judged more extensively on their looks and backgrounds, and are potentially held back by discrimination in their upbringing. Women's share among firms' new hires is used as the best available measure of the effects of firms' recruiting practices on minority applicants' outcomes.

The consideration of applicants' birthplace and appearance in hiring decisions is inappropriate because they are highly correlated with applicants' ethnicity, belief system, and social status. Height and weight, typically used by employers as indicators of appearance, are correlated with health. Surveying of appearance also affects male and female applicants, and applicants of different ages differentially, explicitly violating gender and age-based equal-opportunity laws. The practice of sorting applicants by the name of their university has come under criticism for promoting *hakyon* casteism, elitism and extreme academic competition in the society. School name is not sufficiently predictive of productivity on the job, while it is highly correlated with applicants' socio-economic and residence status, as well as with parents' own academic history. Evidence from interviews suggests that employers prefer workers of pleasant appearance, from the same birthplace and academic background as themselves, for taste-based, bonding reasons. Employers counter that these factors improve harmony and productivity in work teams and in service occupations.

During 2004–2012, the timeframe of our analysis, the Korean labor market underwent various significant transofrmations. National antidiscrimination legislation, and labor laws pertaining to the hiring of regular and irregular workers strengthened. This section reviews these developments in relation to firms' recruiting practices.

Korea has a full set of anti-discrimination laws. In particular, the Equal Employment Opportunity Act (1987) prohibited discrimination and harassment on the basis of age, sex, marital status, pregnancy and childbirth. Article 7 prohibited employers from considering candidates' personal attributes, and prohibited disparate impact of intrusive employment practices on protected groups. The National Human Rights Commission Act of 2001 banned nineteen factors from consideration in employment, including health, appearance, family background, region of origin, ideology, social status, marital status and military experience.

One problem is that enforcement of these laws is lax, penalties are low, and additional areas of discrimination arise as the economy evolves. Enforcement and compliance are particularly weak in the 'secondary,' informal employment market (Schauer, 2018; Hlasny, 2021). Efforts to broaden and harmonize regulations, educate employers and hold employers accountable have been undertaken. New antidiscrimination laws were introduced in step with social developments and the public drive to assist vulnerable groups and to facilitate equal opportunities. Newly enacted were the Act on the Prohibition of Discrimination of Disabled Persons and Remedy against the Infringement of their Rights (2007, amended in 2011), the Ministry of Employment and Labor's guidelines for appropriate recruiting practices (MOEL, 2007), the Act on the Promotion of Economic Activities of Career-Interrupted Women (2008), and the Act on the Protection, etc., of Dispatched Workers (2012).

Beside antidiscrimination laws, labor laws regarding the hiring and treatment of irregular workers also changed with the passage of the Act on the Protection, etc. of Fixed-term and Part-time Employees in 2007. Between 2004 and 2007, the government also scaled up (re)training programs for job-seekers, irregular workers, workers of small-and-medium-size enterprises, female household heads, and other vulnerable groups (Ra and Shim, 2009). The Workers Vocational Skills Development Act (amended 2008) and the Promotion of Industrial Education

and Industrial Cooperation Act (amended 2013) enacting a Vocational Education System were signed.

The aim of this research is thus to take stock of employers' recruiting practices and the environment in which these operate, and understand their implications for the employers' and workers' outcomes. The research problem is to formulate predictions regarding the determinants of applicant screening used by firms in different labor-market circumstances, and regarding the effect of screening practices on firms' hiring choices, and to test them using representative, high-quality data. Estimable models are proposed for firms' extent of screening, firms' ranking of applicants' birthplace, appearance and school name among selection criteria, and gender ratio among firms' new hires. These models are estimated using panel-data methods applied to the Human Capital Corporate Panel (HCCP). We identify risk factors compelling firms to screen applicants' personal backgrounds, and consequences of the choice for applicants from protected groups. The use of a large panel dataset on firms' recruiting practices, and evaluation of how these practices affect firms' hiring of protected workers, represent significant contributions of this study to existing literature.

2. LITERATURE REVIEW

A series of recent academic studies have evaluated motives for employers in Northeast Asia to screen job applicants' personal characteristics. These studies have shown theoretically and empirically that the intrusive screening practices are systematically related to firms' intensity of skill needs, availability of skills in their applicant pools, cost of commitment to particular applicants, and expected costs of intrusive screening. Firms' economic circumstances, including tightness of labor supply, market position, or compensation and working conditions typical in the relevant market, help to explain the practices, particularly for general-interest characteristics such as appearance or family background.

Hlasny (2009, 2011, 2014) outlined Korean firms' problem of inferring job applicants' skills through screening, and estimated the probability of screening individual personal characteristics as a function of the features of job openings, companies and their owners. Applicants' characteristics appear to be screened in a hierarchical pattern whereby companies screen information in the diminishing order of their predictive power or increasing order of their cost.

Studies in other countries have similarly found that employers survey applicants' appearance, ethnicity and residence status, or health and family status, in violation of antidiscrimination laws. Employers screening applicants' resumes may also make discriminatory decisions inadvertently (Derous and Ryan, 2019). In China, a commonplace practice among employers is to screen gender, age, appearance and ethnicity. This practice is systematically related to employers' skill needs, unexpectedly persistent regardless of changing competitiveness in the labor market (Kuhn and Shen, 2013, 2015). Hlasny (2017) identified four motives of applicant screening: statistical, customer-taste, and employer-taste based discrimination, and compliance with local regulation.

Harcourt and Harcourt (2002), and Wallace et al. (2002) found that most employers in New Zealand and the United States also asked legally "inadvisable" questions about health, age and marital status for statistical reasons. Employers in different countries pay different attention to different factors, such as workers' health and current marital status *versus* their beliefs, religion and family history. However, the practice of considering personal factors by various employers is qualitatively similar across Western and East Asian countries.

In the context of human resource management in Korea, a broader literature has emphasized Korean firms' unique institutional circumstances, including management and ownership structure and social norms regarding firm hierarchy, and their persistence over time (Debroux et al. 2018; Froese et al. 2018; Cooke et al. 2020). Horak (2014, 2017) also discussed the role of informal networks (*yongo* in Korean) developed based on school affiliation (*hakyon*), family (*hyulyon*), and regional origin (*jiyon*).

These existing empirical studies have several limitations. They have only evaluated companies' screening practices, rather than their actual hiring choices or consequences of the screening practices on applicants' labor-market outcomes. Small sample and non-random sample selection restrict inference that can be drawn from them. Outliers may affect their findings systematically. Companies' screening can only partially be explained by economic considerations. Applicant screening is subject to non-economic reasons, a 2-3 year inertia, and economic considerations that would become relevant only if an applicant were actually hired. Some HR officers are unfamiliar with national anti-discrimination laws, or even with the reasons for their company's screening practices. Employers' screening sieves out protected workers without improving companies' performance (Hlasny and Jeung, 2014).

This study contributes by relying on a large panel dataset on firms' recruiting practices and labor-market conditions. By measuring firms' screening practices over time, and matching them with changing economic conditions in regression specifications with industry-group fixed effects, time-constant screening due to non-economic reasons or due to inertia is controlled away. A relevant set of appropriately-lagged controls is used to assess the role of employers' skill needs and constraints on employers' practices. Finally, this study uses information on firms' hiring choices to infer consequences of firms' screening practices for protected classes of job applicants including women, the elderly or disabled, or the ethnic minorities.

3. METHODOLOGY

Existing literature suggests several hypotheses about the role of firms' screening practices that can be evaluated using information in the HCCP. Firms' skill needs, constraints on their recruiting and screening practices, and supply of qualified workers in applicant pool are thought to affect the extent of screening of job applicants by firms (Wallace et al. 2002; Harcourt et al. 2005a; Kuhn and Shen, 2013, 2015). Accordingly, the profile of firms' new hires depends on firms' skill needs, the supply of qualified workers in firms' applicant pools, constraints on firms' hiring, and firms' screening practices. These hypotheses are formalized as hypotheses 1–7.

H1: The degree of skill intensity of production affects the extent of firms' applicant screening positively. Moreover, firms' need of skills predictable by applicants' socio-economic background including birthplace and *alma mater* (e.g., integrity, trustworthiness, self-confidence), and appearance (skills at public appearance, persuasion, and conveying of trust) affects positively the ranking of these factors among characteristics screened.

We should distinguish companies that require high levels of easy-to-evaluate hard skills (e.g., numerical, technical, analytical), and those requiring hard-to-evaluate soft skills (resourcefulness, complex problem solving, and capacity for self-development or comprehension of work organization). Employers using proprietary technologies or information are more likely to ask detailed personal questions than other for-profit employers, to gauge applicants' trustworthiness and expected turnover. Evidence from previous studies suggests that financial sector employers tend to enquire about personal information more than other for-profit employers. Employers in industries that require technical and creative reasoning are more likely to consider applicants' personality and professional background, and

less likely to consider applicants' physical background. Companies in team-service and sales industries also discriminate among applicants based on inferred preferences of their existing employees or typical customers. The type of typical customers also affects the relevant labor laws and the importance of public relations to a company. These curb recruiting practices of affected firms.

H2: Expected costs of incremental screening, including shadow costs under relevant labor laws and public relations considerations affect the extent of screening negatively.

The existence of formal, dedicated human resource (HR) departments or a personnel committees on companies' boards is expected to curb the ability of individual hiring managers to choose screening practices that are too intrusive or arbitrarily. The level of organization of workers also affects employers' ability to use discriminatory practices against workers and applicants (Chang and Chae, 2004; Harcourt et al. 2005a). However, unions also make it more costly to compensate workers and difficult to lay workers off, and thus more costly to make mistakes in hiring. Unions may also prop up traditional patriarchic practices at companies, thus allowing screening practices to survive (Lee et al. 2001). The direction of the effect of worker organization on recruiting practices and hiring choices is therefore unclear.

Hypotheses 1 and 2 are the central hypotheses of this study as they evaluate firms' internal skill-demand explanations justifying or curbing their screening practices. Another natural curb on firms' screening practices is facilitated by the supply of qualified workers in their applicant pools.

H3: Width of the distribution of skills available in the applicant pool for vacancies affects the extent of screening positively.

The availability of skills from which employers may choose is affected by the typical number of applicants per opening at a firm (positively) and tightness of local labor market (negatively).

Regarding firms' observed hiring choices between protected and non-protected applicants, several hypotheses can be tested. The share of women among new hires is thought to depend on employers' needs of male- vs. female-dominating skills, on the availability of qualified male applicants in applicant pool, on constraints on gender ratios among hires, and on the extent of screening of intrusive, gender-biased applicant characteristics.

H4: Firms' self-reported skill needs have bearing on the share of women among firms' new hires. Specifically, firms' need of interpersonal and communication skills affects the female share positively, while the need of numerical, technical and complex problem solving skills affects it negatively.

The expected signs of impacts of various skill needs come from employers' perception of the relative prevalence of those skills among male *versus* female applicants. Because skill needs are self-reported by employers, even if we find the expected coefficients on the corresponding skill needs, it will be unclear whether it represents a validation of employers' hiring decisions, employers' rationalization of the hiring decisions, or merely inference of applicants' skills based on perceived group characteristics even when in fact men and women have similar skills. A related hypothesis concerns the supply of qualified workers in firms' applicant pools.

H5: Supply of skills across applicants in firms' applicant pools affects female share of firms' new hires negatively.

The availability of qualified non-disadvantaged applicants in the applicant pool, the lesser need for firms to hire disadvantaged applicants. Firms' facing larger applicant pools per vacancy and firms hiring more workers than they previously planned to hire are expected to hire a lower

share of women. This is because the higher number of qualified applicants per effective hiring affords them an extra slack vis-à-vis general supply of skills, and induces them to replace female hires with newly-available qualified males. This corresponds to evidence that women are the last to be hired and first to be laid off (Lee et al. 2001). Similarly, hiring of more workers than planned affords firms slack with respect to anti-discrimination laws. After hiring a baseline number of women, firms continue hiring based on statistical and taste-based factors, and choose only men. Another argument for expecting a negative relationship is that it may be caused by firms' finding an unexpectedly high distribution of skills among their mostly-male applicants. That induces them to hire a lower share of women.

H6: The greater the institutional constraints on firms' choice over hiring – more formal corporate governance, greater worker organization or stricter legal jurisdiction – the higher the female share hired. Larger firms with professional management, formal HR department, or personnel committee on corporate board, and firms with larger HR departments are expected to recruit a higher share of women. Firms with foreign management or with operations overseas, and firms with stronger organization among their workforce, are similarly expected to hire more women.

The final hypothesis is that, the greater the extent of applicant screening based on gender-biased characteristics that firms practice, the more likely it is that personal biases interfere and firms – inadvertently or intentionally – hire an inadequate share of women.

H7: Taking firms' skill needs, skill availability, constraints on hiring and other characteristics as given, the more extensive the firms' screening process, and the more they are based on intrusive, gender-biased factors, the lower the expected share of women among new hires.

Hypothesis 7 is an important hypothesis in this study, as it evaluates the existence of an adverse impact of firms' practices for the career outcomes of protected classes of job applicants. Hypothesis 7 also follows a conjecture that the less transparent the screening processes at firms are, the worse impact they have on protected groups of workers. In relation to the screening practices evaluated here, firms' screening of appearance, birthplace and *alma mater* is thought to be gender-biased and to affect particularly adversely female applicants. This is because women are judged more extensively on their looks, are judged as harshly as men or more harshly on their upbringing, and are possibly held back by discrimination in their upbringing and schooling. Family background and birthplace may thus leave a more pronounced impacts on their career outcomes than on male candidates. The significant presence of women's-only secondary schools and universities in Korea also means that women's *alma mater* may inform employers about the job applicants' socio-economic background and experience with competition and teamwork in a unisex environment – to a greater degree than men's *alma mater*.

3.1. Estimable Model of Recruiting Practices and Implications for Workers

To evaluate the above hypotheses regarding the role of applicant screening in firms' recruitment, reduced-form economic models are used. These models allow us to estimate the determinants of the extent and form of screening at firms with different characteristics or in different circumstances, and evaluate the observed consequences for firms' hiring choices.

The extent of employer *i*'s screening of applicants' personal characteristics in a year is made a function of employers' self-reported skill needs, available measures of the costs and constraints on screening, and inferred distribution of skills in the applicant pool. These three factors jointly determine firms' expected benefits of screening and the chosen extent and form of screening. In addition to the economic factors modeled explicitly, employers may face non-economic factors, such as industry norms, secular nationwide trends, or idiosyncratic corporate-governance

structures that affect firms' recruiting practices. To account for such factors, industry-level time trends and selected observable characteristics of firms are controlled for (written jointly as x_{it}). Latent time-constant factors at the industry level, denoted for simplicity as μ_i, are accounted for using industry fixed effects. Finally, employers may also respond to economic factors with varying speed, or the dependent variable and some explanatory variables may be observed imprecisely. Screening practices are thus subject to time-varying firm-specific randomness, ε_{it}:

$$screen_{it} = f(skill\ needs_{it}, constraints_{it}, pool_{it}, x_{it}) + (\mu_i + \varepsilon_{it}) \quad [1]$$

Employers' ranking of applicants' personal characteristics – applicants' birthplace, appearance and school-name – among screening factors, and the count of stages in employers' recruiting process, will serve as alternative measures of the extent of employers' screening practices, and the dependent variables in models estimated below.

Among available explanatory variables, we may use employers' self-reported importance assigned to various skills in their workforce: interpersonal and communication skills; numerical and technical skills; resourcefulness, information processing and complex problem solving; and capacity for self-development and comprehension of work organization. Propensity to ask personal questions should also vary across industries that require different skill sets in their workforce, and across firms operating only domestically and those operating abroad.

Beside firms' skill needs, one must account for any costs or effective constraints on firms' recruiting practices. The existence of a formal, dedicated HR department and of a personnel committee on firms' board, and the level of organization of workers are used to proxy for the ability of individual hiring managers to use discriminatory practices. The availability of skills in firms' applicant pool is proxied for by the typical count of applicants per vacancy.

Other firm characteristics may also affect firms' benefits and costs of screening, as well as the information environment they face. Foreign management or operations abroad may help to proxy for constraints imposed by foreign legal norms (or even indicate different skill needs). Demographic profile of firms' existing workforce may help to account for employers' unobserved biases, employee discrimination, or employers' need for workforce cohesion. Firm size helps to account for other omitted institutional details regarding the determination of firms' recruiting process.

To evaluate the consequences of firms' chosen screening practices for protected applicants' outcomes, we also estimate a relationship between firms' screening practices and the demographic composition of their new hires. The share of protected workers (women) among new hires serves as the dependent variable. This is made a function of employers' skill needs, the availability of qualified non-protected applicants in firms' applicant pool, institutional constraints on firms' hiring, and the extent of firms' screening practices and of the gender-biased factors screened. In addition to these economic factors, unobserved or non-economic elements may taint firms' hiring choices. Industry norms, secular labor-market trends, or firms' existing labor composition and corporate governance may affect firms' hiring. Accounting for such factors are industry-level time trends and selected observable characteristics of firms (grouped as x_{it}). Latent time-constant norms at the industry-group level, denoted for simplicity as λ_i, are accounted for using industry-group fixed effects. Finally, randomness or measurement imprecision may also affect the observed hiring choices. As a result, $\%women_{it}$ is subject to firm-specific time-varying randomness, u_{it}:

$$\%women_{it} = f(skill\ needs_{it}, pool_{it}, constraints_{it}, screen_{it}, x_{it}) + (\lambda_i + u_{it}) \quad [2]$$

Firms' skill needs are measured using the importance they attribute to various worker skills, grouped into four categories. Our expectation of the effects of $skill\ needs_{it}$ corresponds to the

employer-perceived relative prevalence of those skills among male *versus* female applicants. Availability of qualified applicants is deduced from the number of applicants per vacancy and the number of actual-to-planned hires. Firms' constraints on hiring are gauged from the presence of professional management, formal HR department, size of firms' HR department, personnel committee on firms' corporate board, and firms' size. Presence of foreign management, operations overseas, and stronger organization among firms' workforce are also accounted for. Finally, the rankings of applicants' birthplace, appearance and school name among criteria for selecting applicants control for firms' intrusive, gender-biased screening practices.

3.2. Estimation Method

Linear regressions on pooled cross-sectional data and panel-data methods are used to test hypothesis formulated in previous sections. These methods are believed to produce robust and consistent estimates of the effects of interest, even if they may not be fully efficient due to the discrete nature of the dependent variable $screen_{it}$.[1] Panel structure of HCCP data helps to account for various estimation issues, including lagged effects among variables (from demographic profile of existing workforce, or unionization, to screening practices and hiring choices), possible bias and inefficiency due to unobserved industry-specific heterogeneity, and autocorrelation in errors. A number of explanatory variables will be used in their first-lag form (lagged by 2 years) to mirror the real-life lagged dynamics of their impact, and to ensure identification of a one-way, causal effect from them on the dependent variables.

Errors in equations 1 and 2 have two components, industry-level time-constant latent heterogeneity and time-varying idiosyncratic disturbance. Because the time-constant component may be correlated with explanatory variables, regressions with fixed effects at the level of six industry-groups (manufacturing; energy-related; information and telecommunications; finance and insurance; other services; and other industries) are used. The assumption is that much of the time-constant heterogeneity correlated with our variables of interest occurs at such industry-group level. Industry-group rather than industry- or firm-specific fixed effects are used because many variables in the model vary rarely or only modestly over time for individual firms, and industry demarcation changes over time.

For a number of reasons – including limited-value nature of the dependent variables, possible measurement errors in dependent and explanatory variables, firm-level heterogeneity and possible inertia in decision-making – model errors are corrected for heteroskedasticity and firm-level autocorrelation. The Breusch-Pagan and the Breusch-Godfrey tests reject homoskedasticity and no-autocorrelation in both equations 1 and 2.

3.3. Data

Data for this study come from the Human Capital Corporate Panel dataset managed by the Korea Research Institute for Vocational Education and Training (KRIVET). The panel contains 1,901 observations for 568 firms and five biannual time periods (2004–2012). Firms in the panel

[1] Ordered probit models and Poisson count-variable models were considered as potentially more efficient estimation techniques. However, they have drawbacks in regard to robustness. They rely on restrictive identification assumptions or distributional assumptions that are not satisfied in the data. Ordered probit is typically used for ordinal indicators for which assumptions have to be imposed on the relationship between individual values. In this study, the ranking variable has cardinal interpretation, so this step imposing a restrictive structure is unnecessary. Poisson models rely on the distribution of errors and their dispersion. These may affect adversely consistency and efficiency of estimates. In the available data, the distribution of screening stages does not follow Poisson distribution even approximately. Negative binomial distribution, is also not thought to produce an improvement over OLS. Linear OLS is more consistent and potentially more efficient when models must be augmented with fixed effects and corrections for error heteroskedasticity and autocorrelation.

have been selected randomly using stratification methods to facilitate comparison of the sample to the underlying population of employers.

Variables in the HCCP dataset include: the ranking of personal factors (birthplace, appearance, school-name) among all criteria for selecting applicants[2]; number of stages in firms' recruiting process; self-reported importance attributed to various worker skills (interpersonal and communication skills; numerical and technical skills; resourcefulness, information processing and complex problem solving; capacity for self-development and comprehension of work organization); applicants per vacancy; actual per planned hires; worker unionization and affiliation with the strong Minju trade-union umbrella; existence and size of HR departments; existence of personnel committees on corporate boards; foreign management; overseas operations; and composition of workforce (percent female, college-educated, or over 40 years old). (Refer to Table A1 in the Appendix.)

4. RESULTS

The economic model proposed in equation 1 includes three sets of variables of interest affecting firms' screening practices explicitly: firms' skill needs, constraints on screening, and availability of skills in firms' applicant pools. Table 1 shows the results of complete specifications of this model. Coefficients can be interpreted as the effects of a one-unit change in explanatory variables on firms' ranking of job-applicants' birthplace (columns 1–2), school-name (columns 3–4) or appearance (columns 5–6) among worker-selection criteria, or on the count of stages in firms' recruiting process (columns 7–10).

Rows 1–4 in table 1 show the estimates on measures of importance attributed by firms to applicants' various skills. While the estimated coefficients are insignificant individually or in most cases even jointly, they have the same signs across pairs of columns with the same dependent variables, and alternate in sign across models for different forms of screening. This suggests that firms with different skill needs rely on different forms of screening.

The effects of skill needs on the complexity of firms' recruiting process (rightmost four columns) are more significant. Firms relying on workers' numerical and technical skills, and on their capacity for self-development and comprehension of work organization among more senior-level workers are systematically predicted to subscribe to longer multi-stage recruiting processes. Firms relying on interpersonal and communication skills, and those relying on workers' resourcefulness and problem-solving skills have systematically shorter recruiting processes.

Rows 5–8 show that the available measures of constraints on employers' screening appear to explain applicant-screening practices better than employers' skill-needs. Among institutional constraints, operating overseas, existence of a dedicated HR department, and unionization of workers are associated with significantly more complex recruiting processes, but mostly a lower role of the screening of applicants' personal factors. These findings suggest that operating under foreign jurisdictions or under more formal norms of institutional governance forces hiring managers to rely on more objective but also more bureaucratic recruiting practices. Existence of a personnel committee on a firm's board is found to reduce the complexity of its recruiting processes slightly. One possible explanation lies in the interaction between firms' HR departments and personnel committees, such as executive board members' power to override HR managers' decisions.

[2] Among 13 criteria: school completion, specialization, grades, school name, career experience, certificates, integrity, experience with teamwork, job competency, future potential/foreign language fluency, birthplace, appearance, and other.

Row 9 reports on the effect of the applicant pool size per opening, indicating the available distribution of skills from which employers choose. This variable has an expected positive effect on the importance firms attribute to applicants' school name, as well as an expected effect on the complexity of firms' screening process.

Finally, rows 10–13 in table 1 control for companies' other characteristics. Demographic profile of firms' current workforce helps to explain firms' practices. Particularly worth mentioning, firms with more highly educated workforce place less emphasis on applicants' birthplace and appearance, and more emphasis on their *alma mater*. Rather than implying that school name is a valid signal of applicants' skills, this points to the prevalence of statistical and taste-based discrimination at professional firms (i.e., *hakyon* or elitism). This may reflect path dependence in firms' recruiting, whereby firms who have hired workers with specific skills tend to screen for workers with similar skills. This may be because of coworker discrimination or because of perceived complementarity in the productivity among workers with similar mindsets.

Firm size contributes significantly. Larger firms are less likely to screen personal information, but have by far more bureaucratic screening processes. Overall, regressions in table 1 explain a small share of variation in screening practices over time, 3 to 18 percent, evidenced by models' within R-squared. There are either many factors affecting the screening decisions that our specifications haven't controlled for, or firms' reports about the importance they attribute to applicants' personal characteristics are subject to heterogeneity across individuals and years. In any case, model F-statistics indicate that all models are statistically significant compared to models containing only industry-group fixed effects.

Table 2 reports the results of regressions estimating the share of women among firms' new hires using four sets of economic variables, in accordance with equation 2. Coefficients shown are the percentage-point effects of a unit change in explanatory variables on the proportion of women among firms' new hires. The first four columns report on models without any treatment of panel components except for autocorrelation in errors. The right half of the table reports on regressions using fixed effects at the level of industry groups.

The first set of controls in table 2 deal with firms' decisions made during recruiting regarding the importance assigned to applicants' birthplace, *alma mater* and appearance, and the count of stages in the recruiting process. These have little impact on the demographic profile of new hires. Our hypothesis – that firms' hiring practices and self-checks for the presence of incidental personal biases affect the composition of their hires – is not supported.

The second set of explanatory variables account for firms' skill-needs. If women are thought to have a different distribution of skills than men – or they actually do through a self-fulfillment prophecy – different employers will have different demand for female workers. Rows 5–8 in table 2 strongly support this. Firms' need of interpersonal and communication skills, and capacity for comprehension of work organization among their workers affect the female share in hiring positively, while the need of numerical and technical skills affects it negatively. The importance of resourcefulness and complex problem solving skills affects the female share weakly positively (insignificant).

The third set of variables, in rows 9–15, control for constraints on firms' hiring decisions imposed from outside. Since different employers have different stakeholders, and realize different implicit costs of violating equal-opportunity norms, they are expected to hire a different ratio of women to men. The results are mixed. The existence and size of an HR department, and the existence of a personnel committee on firms' boards have mostly positive effects as expected, but these are insignificant. Company management by professional managers, rather than by parties related to owners or founders, is associated weakly negatively

with the female share. Unionization of workers has a similar weak negative effect, corroborating evidence by Lee, Cho and Lee (2001) and others that unions may support patriarchic norms in organizations rather than counteracting them to promote fair hiring.

Foreign management is associated with a higher female share among hires, as expected if jurisdictions to which foreign managers answer have stricter equal-opportunity laws. Finally, firms operating overseas – through sales, production or R&D – are found to hire a lower ratio of women. This is counter to our intuition that firms facing multiple regulatory regimes should set their bar on equal-opportunity practices higher to comply with all the regimes. The strong negative effect presumably stems from the particular nature of firms selling, producing or innovating in foreign markets. Even after controlling for time-constant heterogeneity across industries, it is possible that as firms expand their operations abroad, they hire more men who are viewed as more loyal and flexible for travel and business meetings.

The next two variables test the role of the supply of qualified workers in firms' applicant pools. Applicants per vacancies, standing for the supply of skills or a slack in firms' choice over whom to hire, carry the expected negative but insignificant coefficients in columns 4 and 8. Actual to planned hires, proxying for firms' slack in hiring a particular share of women, carry the expected negative coefficients. When firms decide to hire more workers than planned, they are thought to have already met their plan on the number of female hires, and so the extra hires can be chosen with less regard for equal opportunity laws. Secondly, since firms face male-dominant pools of applicants, an unexpectedly high distribution of skills in the pool may induce them to hire more workers, and to simultaneously choose a lower ratio of women to men.[3]

Among the four hypotheses about the determinants of female hiring, table 2 points strongly to the importance of firms' skill needs, and partially to the importance of constraints on firms' recruitment and skill supply in firms' applicant pools. Firms' screening practices do not help to predict firms' hiring choice between men and women.

The final set of results in table 2 relate to firms' other characteristics. Larger firms and firms already employing more women hire a significantly higher share of women. Larger firms typically operate under greater external and internal scrutiny and have a greater absolute stake in good publicity. Firms employing fewer women may hire fewer women because of coworker discrimination or because of complementarity of productivity among workers of the same gender. Workers and their supervisors (or colleagues) may be more productive when both are of the same gender, leading to path dependence in hiring.

Regressions with fixed effects explain 9-17% of intertemporal variation in the share of women among firms' hires. Given the small number and narrowness of explanatory variables used, and heterogeneity of economic and legal conditions over time, this is quite successful. Firms' measurable skill-needs and screening practices explain only 9% of variation in the female-share hired, while institutional, regulatory and demographic constraints on firms' practices explain an additional 8%. Many firms, regardless of their HR needs, may have a similarly low demand for female labor, and they only increase their recruitment of women when institutional, regulatory or demographic forces nudge them.

[3] In this case, the coefficient on actual-to-planned hires does not have a causal interpretation, as it reflects the effect of exogenous shocks in the distribution of skills in firms' applicant pools. Actual-to-planned hires are potentially endogenous. It would be appropriate to use instrumental variables for them to capture only the causal relationship. Unfortunately, candidates that would be highly correlated with skill-supply shocks at the firm level, and uncorrelated with the female share among hires – such as mass layoffs (of male workers) at competitors – are unavailable empirically.

5. DISCUSSION AND CONCLUSION

This study was motivated by two unresolved questions: What economic factors affect firms' choice over how complex their recruiting processes are? And, what economic factors affect their practice of screening applicants' personal backgrounds? The study also investigated the implications of firms' screening practices for the employment of protected workers. The research questions asked, and the use of large, high-quality panel data to answer them represented significant contributions to existing literature. Because prior studies used other measures of recruiting practices and their consequences, and relied on less representative datasets, the results of this study serve to qualify our existing understanding of firms' recruiting practices and their settings.

The study confirms the broad findings in prior studies that firms' screening practices are partly due to institutional and regulatory constraints on firms' HR management, and the skill supply in firms' applicant pools (Mellow, 1982; Park, 1990; Harcourt et al. 2005a,b). Interestingly, the available measures of employers' skill needs do not explain applicant screening as much as constraints on those practices do, suggesting that firms choose extensive degree of screening by default unless stopped by equal-opportunity laws, regulations, or customer backlashes.

Among institutional constraints, operations abroad, existence of a dedicated HR department, and unionization make the structure of the recruiting process more complex, while diminishing the influence of applicants' individual personal factors. Firms' reliance on workers' numerical and technical skills, and on their capacity for self-development and comprehension of work organization makes them subscribe to more complex, multi-stage recruiting processes. Reliance on interpersonal and communication skills, and on workers' resourcefulness and problem-solving skills is conducive to systematically shorter recruiting processes.

Firms employing more educated workers have greater needs for careful screening and for the screening of applicants' educational history. This could be due to complementarities in the productivity of existing skilled workers and skilled hires, due to coworker discrimination, or due to other latent reasons. Size of the applicant pool, indicating the available distribution of skills from which employers choose also has an expected positive effect on screening.

Firms' reported skill needs have the expected effect on the proportion of women among new hires. The importance attributed to applicants' appearance, interpersonal and communication skills, and skills useful in hierarchical organizations favors female applicants, while the importance attributed to numerical and technical skills favors men. This may reflect on an actual differential in the skills of male and female applicants, or employers' group-based inferences of them. Gender composition of existing workforce, proxying for employers' latent biases or needs to hire male workers – to take advantage of complementarities across workers, or ensure workforce cohesion – contributes.

Greater company size and the presence of foreign management favor female applicants. Labor unionization disfavors female applicants, either because unions buttress patriarchic norms in firms' HR management, or because of a greater prevalence of unions in male-dominated sectors and earlier time periods. The size of applicant pool per opening works against female applicants. The more choice employers have over whom to hire, or the greater the availability of skills among predominantly-male applicants, the less likely employers are to hire women. If employers decide to hire more than the planned number of workers, a lower proportion of hires are women, suggesting that the decision to hire more workers provides a slack vis-à-vis firms' labor-regulation constraint, or itself comes from an unexpectedly high distribution of skills among predominantly-male applicants – nudging firms to select only men for the additional openings.

Many of these findings provide a plausible narrative regarding firms' choice over how to screen applicants and what demographic composition of workers to hire. The findings are consistent across the various models and the two sets of dependent variables (table 1 vs. 2), serving as robustness checks for one another.

With these findings in mind, a word of caution is warranted. Variables studied here are self-reported and are subject to recollection, self-affirmation and other biases. Employers may inadvertently misrepresent their skill needs, screening practices or hiring choices, and the biases across these sets of variables may be systematic. Moreover, practices investigated here do not cover all HR practices including the screening of other personal characteristics, screening after hiring is decided, or decisions about compensation and promotion. The true scope of the problem may be systematically greater at firms. Without information how the investigated practices fit into firms' larger HR management systems, and without any indication about the direction of additional biases, we may take the estimates as our best predictions about the variables' true effects on employers' overall practices.

Provided that employers' responses in the HCCP survey can be viewed as representative of their true practices, findings from this study should be useful to regulators and lawmakers who have the mandate and ability to mold the regulatory, institutional and legal environment in which employers operate. The study's main implications are that organizational and regulatory constraints are effective at shaping firms' practices, compared to, say, firms' own skill-needs motives. The study therefore advises policymakers to enforce rules that promote equitable recruitment. Harmonized recruitment practices, anonymized recruiting (Rinne, 2018), or automated hiring systems (Köchling and Wehner, 2020; Sánchez-Monedero et al. 2020) could be promoted to this end. These systems should govern the content of screening; procedures regarding the complexity of screening practices; timing when individual characteristics should be screened (at which stage of recruiting, or after hiring); rules how applicants' answers can be used by firms' HR systems; and options for applicants how to respond to intrusive questions. Public education campaigns regarding recruiting norms should be conducted. To ensure that recruiting practices do not harm protected applicants, adverse-impact laws should be synchronized with procedural recruiting rules.

The implications of firms' economic and regulatory environments for their screening practices and eventual hiring choices are important not only for policymakers but also for HR managers. This study provides information about norms at other firms, and feedback about inadvertent effects of firms' recruiting practices on the demographic composition of their hires. This is important because applicant-screening can result in legal liability or backlash from consumers, and is costly in terms of information collection and processing, while its effect on workforce productivity or profit is dubious.

This study corroborates previous findings that the human resource management at Korean firms is not transitioning toward merit and skill-based recruiting practices, and continues to rely on subjective factors (Hlasny, 2022). This has implications for workers and for policymakers in Korea and the wider East Asia region tasked with ushering in more inclusive, objective and meritocratic personnel management practices. Finally, this study sheds light on organizational structures that are more conducive to equitable recruiting practices than others. This can assist national and multinational firms, as well as policymakers worldwide, with identifying corporate-governance pitfalls, and structures most conducive to complying with equal-opportunity norms and best aligned with sustainable human resource management, without compromising their corporate objectives.

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Table 1. Results of Regressions Explaining Firms' Screening Practices

		Birthplace & background		School name		Appearance		Recruiting stages			
		(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(3)	(4)
Skill needs	Interpersonal & communic. skills	0.009	0.011	0.042	0.06	-0.007	-0.004	-0.025	-0.026	-0.037	-0.037
		(0.029)	(0.031)	(0.080)	(0.084)	(0.045)	(0.048)	(0.071)	(0.070)	(0.065)	(0.068)
	Numerical & technical. skills	0.018	0.018	-0.123	-0.103	-0.016	-0.024	0.161**	0.098	0.071	0.072
		(0.030)	(0.032)	(0.084)	(0.088)	(0.031)	(0.032)	(0.074)	(0.074)	(0.071)	(0.073)
	Resourcefulness & problem solving	-0.005	-0.007	-0.071	-0.094	0.069	0.068	-0.015	-0.019	-0.024	-0.014
		(0.029)	(0.031)	(0.095)	(0.099)	(0.049)	(0.051)	(0.097)	(0.099)	(0.097)	(0.100)
	Self-dev. & organ. comprehension	-0.022	-0.021	-0.037	-0.059	-0.014	-0.006	0.119*	0.130**	0.116*	0.103
		(0.024)	(0.026)	(0.068)	(0.069)	(0.024)	(0.025)	(0.068)	(0.066)	(0.065)	(0.068)
Screening constraints	Overseas operations	-0.082***	-0.087**	0.009	0.007	-0.024	-0.015		0.171***	0.112**	0.097*
		(0.032)	(0.035)	(0.068)	(0.071)	(0.025)	(0.026)		(0.053)	(0.053)	(0.055)
	Board personnel committee	0.011	0.013	0.063	0.034	-0.044	-0.047		-0.071	-0.088*	-0.091*
		(0.027)	(0.029)	(0.067)	(0.069)	(0.033)	(0.035)		(0.055)	(0.053)	(0.055)
	HR department	-0.025	-0.029	0.099	0.082	-0.057**	-0.054**		0.260***	0.208***	0.187***
		(0.031)	(0.033)	(0.065)	(0.067)	(0.025)	(0.025)		(0.055)	(0.055)	(0.057)
	Unionization of workers	-0.076*	-0.078*	0.052	0.061	-0.021	-0.028		0.181**	0.185**	0.157**
		(0.045)	(0.047)	(0.099)	(0.102)	(0.044)	(0.046)		(0.070)	(0.071)	(0.073)
Pool	Applicants / vacancies		-0.010		0.111***		-0.007				0.158**
			(0.009)		(0.037)		(0.007)				(0.073)
Firm type	Total workforce	-0.408	-0.436	0.780	1.227	-0.754**	-0.795**			4.464**	3.940**
		(0.277)	(0.315)	(0.897)	(1.219)	(0.306)	(0.336)			(1.627)	(1.565)
	% female workers	0.032	0.033	-0.274	-0.297	0.081	0.079			0.16	0.119
		(0.110)	(0.124)	(0.260)	(0.268)	(0.066)	(0.070)			(0.182)	(0.197)
	% college-educated workers	-0.166**	-0.198**	0.288*	0.274*	-0.182**	-0.170**			0.598***	0.563***
		(0.082)	(0.091)	(0.172)	(0.164)	(0.078)	(0.079)			(0.153)	(0.167)
	% over-40-yr workers	0.170*	0.169	0.062	0.091	0.086	0.077			-0.196	-0.193
		(0.103)	(0.113)	(0.182)	(0.191)	(0.102)	(0.104)			(0.156)	(0.170)
	Obs./Firms	1,720/454	1,604/448	1,719/453	1,603/446	1,719/454	1,602/447	930/465	849/450	848/449	790/440
	R^2(within)	0.030	0.034	0.028	0.038	0.038	0.033	0.090	0.143	0.180	0.177
	Model F-statistic	1.53*	1.52*	2.16***	2.68***	2.50***	2.17***	3.31***	5.20***	6.03***	5.58***

Linear time trends at industry-group level and constant terms are included. Unionization, total workforce, and % female, college-educated and 40+ year-old are lagged by 1 period (2 years) to capture their full effect. Fixed effects are for 6 industry groups: manufacturing, energy, information & telecom, finance & insurance, other services, and other industries. Effects significant at 1% (***), 5% (**), 10% (*), using standard errors robust to arbitrary heteroskedasticity and firm-level autocorrelation.

Table 2. Results of Regressions Explaining the Share of Women among Firms' New Hires

	Pooled OLS models				Models with industry-group fixed effects			
	Skill needs	+Hiring constraints	+Firm type	+Hiring process	Skill needs	+Hiring constraints	+Firm type	+Hiring process
Birthplace & background	2.790 (1.853)	2.618 (1.800)	2.622 (1.803)	2.625 (1.825)	2.702 (1.880)	2.641 (1.813)	2.558 (1.809)	2.551 (1.835)
School-name	-0.039 (0.608)	0.351 (0.624)	0.344 (0.622)	0.437 (0.622)	-0.029 (0.577)	0.340 (0.605)	0.353 (0.605)	0.436 (0.604)
Appearance	2.941** (1.466)	2.012 (1.617)	2.012 (1.620)	1.925 (1.625)	2.776* (1.477)	2.08 (1.630)	2.027 (1.626)	1.926 (1.635)
Recruiting process stages			0.072 (1.124)	0.184 (1.148)			0.037 (1.125)	0.114 (1.147)
Interpers. & comm. skills	2.808* (1.610)	2.524 (1.648)	2.687* (1.646)	2.735* (1.653)	2.886* (1.608)	2.551 (1.631)	2.617 (1.640)	2.717* (1.650)
Num. & tech. skills	-4.952*** (1.743)	-5.205*** (1.584)	-5.130*** (1.585)	-4.755*** (1.601)	-5.125*** (1.755)	-5.453*** (1.590)	-5.374*** (1.596)	-5.022*** (1.608)
Resourceful. & prob.solv.	2.179 (2.358)	1.086 (2.051)	0.986 (2.079)	0.564 (2.080)	1.517 (2.384)	0.587 (2.080)	0.727 (2.096)	0.287 (2.092)
Self-dev. & org.comprh.	0.584 (1.715)	2.937** (1.494)	2.937* (1.495)	2.837* (1.517)	0.721 (1.709)	3.110** (1.476)	3.096** (1.484)	2.989** (1.505)
HR departmt.		0.232 (1.570)	0.212 (1.559)	0.284 (1.591)		0.052 (1.578)	0.163 (1.568)	0.187 (1.600)
HR depart. size		-0.072 (0.052)	-0.074 (0.053)	-0.072 (0.055)		-0.069 (0.052)	-0.066 (0.053)	-0.062 (0.054)
Professional management		-0.918 (0.617)	-0.945 (0.618)	-0.901 (0.628)		-1.061* (0.621)	-1.052* (0.618)	-0.997 (0.628)
Board personnel committee		0.576 (1.491)	0.585 (1.494)	0.546 (1.507)		0.394 (1.489)	0.473 (1.490)	0.410 (1.499)
Unionization of workers		-4.043* (2.152)	-3.987* (2.271)	-3.792* (2.284)		-2.801 (2.208)	-3.048 (2.285)	-2.852 (2.305)
Foreign management		5.825** (2.719)	5.765** (2.732)	6.121** (2.825)		6.197** (2.713)	6.190** (2.703)	6.595** (2.798)
Overseas operations		-3.627*** (1.412)	-3.719*** (1.418)	-3.507** (1.462)		-3.052** (1.414)	-3.019** (1.409)	-2.765** (1.440)
Applicants / vacancies				-0.944 (0.766)				-0.916 (0.789)
Actual / planned hires				-0.982* (0.536)				-0.936* (0.559)
Total workforce		51.454** (24.738)	52.635** (25.435)	53.351** (27.204)		47.448** (22.837)	43.652* (23.308)	43.525* (24.749)
% female workers		38.615*** (5.218)	38.597*** (5.265)	38.087*** (5.335)		36.992*** (5.158)	36.571*** (5.236)	35.870*** (5.285)
% college-ed.workers			0.399 (3.918)	0.335 (4.015)			-2.528 (4.107)	-2.460 (4.226)
% over-40-yr workers			-1.084 (4.197)	-1.654 (4.239)			0.367 (4.187)	-0.481 (4.220)
Obs./Firms	1,901	1,604	1,603	1,564	1,901	1,604	1,603	1,564
R^2(within)	0.072	0.159	0.160	0.157	0.093	0.172	0.173	0.171
Model F-stat.	7.35***	9.93***	9.11***	7.97***	2.06**	6.15***	5.40***	4.98***

Linear time trends at industry-group level and constant terms are included. Worker unionization, total workforce, percent of women in workforce, percent college-educated and percent 40+ years old are lagged by 1 period (2 years) to capture their full effect. Fixed effects are for 6 industry groups: manufacturing, energy, information & telecom, finance & insurance, other services, and other industries. Effects significant at 1% (***), 5% (**), 10% (*),using standard errors robust to heteroskedasticity & firm-level autocorrelation.

APPENDIX

Table A1. Definition of Variables Used in Regressions

Variable name	Definition [units]	Avg. (st. dev.)[iii]	Min.–max.
Birthplace	Ranking of applicants' region/origin in recruitment among top 5 factors[i] [scale 1–5, 0 if not among top 5 factors]	0.077 (0.435)	0–5
School name	Importance of applicants' school name in recruitment among top 5 factors[i] [scale 1–5, 0 if not among top 5 factors]	0.358 (1.034)	0–5
Appearance	Importance of applicants' appearance in recruitment among top 5 factors[i] [scale 1–5, 0 if not among top 5 factors]	0.084 (0.433)	0–5
Recruiting stages	Stages in recruiting process until job offer is made [count 1–5], for 1,644 observations	3.558 (0.722)	2–5
% women hired	Women among new hires [%]	30.057 (25.804)	0–100
Interpersonal & communic. skills	Importance of workers' interpersonal & communication skills, averaged between the 2 skills [scale 1–5]	3.106 (0.593)	1–5
Numeric & technical skills	Importance of workers' numeric & technical skills, averaged between the 2 skills [scale 1–5]	3.147 (0.566)	1.50–5
Resourcefulness & problem-solving	Importance of workers' resourcefulness, information processing & problem-solving, averaged between the 3 skills [scale 1–5]	3.042 (0.592)	1.33–5
Self-development & organiz. compreh.	Importance of workers' self-development & comprehension of work organization, averaged between the 2 skills [scale 1–5]	2.946 (0.649)	1–5
Overseas operations	Firm has some operations abroad [binary]	0.583 (0.493)	0–1
Personnel committee on the board	Board of directors includes a personnel board [binary], for 1,605 observations	0.664 (0.472)	0–1
Professional management	Level of professionalism of management [1 single owner…4 professional management without owner intervention]	2.246 (1.200)	1–4
Foreign	Management or technical supervision by	0.094 (0.292)	0–1

management	foreigners [binary]		
HR department	Firm has a dedicated HR department [binary]	0.666 (0.472)	0–1
HR department size	Staff in HR department [count], for 1,900 obs.	7.073 (12.535)	0–220
Unionization of workers	Workers are organized in a union [1], or have a labor council [0.5], or none [0], lagged by 1 time period[ii]	0.646 (0.382)	0–1
Minju union	Workers are organized under Minju trade-union umbrella [binary]	0.126 (0.332)	0–1
Total workforce	Firm workers, lagged by 1 time period[ii] [count/1,000]	0.009 (0.023)	0–0.341
% female workers	Female workers, lagged by 1 time period[ii] [%/100]	0.207 (0.169)	0–0.932
% college-educated	College-educated workers, lagged by 1 time period[ii] [%/100]	0.408 (0.237)	0–1
% over-40-yr old	Workers 40+ years old, lagged by 1 time period[ii] [%/100], for 1,900 observations	0.318 (0.187)	0–0.980
Applicants/vacancies	Applicants per opening [ratio/100], for 1,850 observations	0.304 (0.909)	0.005–18.67
Actual/planned hires	Actual per planned hires [ratio], for 1,881 observations	1.083 (0.697)	0.2–23.0

[i] In 2008–2012, evaluated among top 3 factors (coded as 5,4,3, and 0 if not among top 3 factors).

[ii] Lagged value for the first year (value of variables for '02) extrapolated as mean of '04–'12 values, deflated for monetary variables. For worker unionization, extrapolation using the minimum of '04–'12 values is used.

[iii] Unless noted, evaluated in an unbalanced panel of 1,901 observations, 568 firms and 5 biannual time periods, '02–'12.