

Why Do Wages Vary Among Employers?

by Erica L. Groshen

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Introduction

In neoclassical economics, wage rates—like the price of any traded commodity—are determined by both supply and demand. Despite the simultaneous nature of the wage-setting process, recent empirical investigations of the determinants of wages have focused primarily on factors affecting labor supply. Demand factors have been relatively neglected.

During the 1940s and 1950s, participation in the administration of wage and price controls led a distinguished group of economists to examine employer wage policies. Reynolds, Segal, Dunlop, Myers, Lester, and Lewis studied interindustry, intra-industry, union, establishment size, and regional differentials.¹ In essence, they focused on variables controlled by employers (that is, *labor demand*) and medium-run labor supply. Dunlop (1957) summarizes many of these effects in his work on wage contours.

Research on the influence of supply-side factors was stimulated by the development of human capital theory (Becker [1964] and Mincer [1974]), and by the availability of household

surveys, which gather more information on workers than on their employers. Since the 1960s, labor economists have primarily studied variables controlled by employees (that is, long-run *labor supply* factors) such as age, education, and experience.

In the Current Population Survey, a household survey, regressions of wages on workers' characteristics typically produce results similar to those shown in table 1. In this example, the explanatory power of human capital variables is enhanced by exclusion of agricultural workers and of the youngest and oldest workers from the sample. Even within this limited population, the narrowly defined human capital variables explain only a quarter of the variation in the log of wages.² Addition of occupation raises explanatory power by 16 percent, while race, sex, and union variables add another 6 percent. Industry (broadly defined) raises explanatory power to 51 percent of the variation of wages.

What accounts for the 49 percent of wage variation that the equation doesn't explain? Are there other empirical regularities or theories that

■ 1 Segal (1986) and Kerr (1983) summarize the work of these economists.

■ 2 The explanatory power of human capital variables reported in table 1 is actually relatively high compared to that found in many samples because of exclusion of younger and older workers and of agricultural workers.

T A B L E 2

Authors and Year	Data	Relevant Conclusions
7. Wachtel and Betsey (1972)	Survey of Consumer Finances (1967), Institute for Social Research sample of full-time, full-year service and production workers	Residuals of human capital wage regressions (with age, sex, race, job tenure, education, and marital status) are highly correlated with industry-occupation, union status, city size, and region dummies. Conclude that these structural (demand-side) variables, especially industry-occupation, are important determinants of wages because of rigidities in the labor market.
8. Dalton and Ford (1977)	1970 U.S. Census sample	Industry earnings increase with concentration up to a ratio of 0.5, after which they are stable. Sex and race differentials are large and significant for high concentration industries, while industry growth rate affects wages only in the more competitive industries. Regional differentials were significant but had changed since 1960.
9. Pugel (1980)	IRS profits by 3-digit industry, merged with industry average demographic and market data	Workers receive 7 percent to 14 percent of total excess profits: some of which buys higher skills, the rest of which is rent.
10. Krueger and Summers (1986a,b)	CPS, May 1974, 1979 and 1984; Quality of Employment Survey 1977	Industry wage differentials do not disappear when controlling for measured or unmeasured differences in human capital or for compensating differentials. Consistent with efficiency-wage models, lower turnover and better performance are apparently characteristic of high-wage industries.
11. Dickens and Katz (1986, 1987)	Current Population Surveys — all nonunion respondents for 1983	Divided workers into 12 occupational categories, calculated industry wage differentials in raw data, fixed effects equations (with human capital) and from residuals of human capital equations. Found that industry differentials are large, persistent, and correlated across occupations and countries. They are also correlated with industry characteristics: percent male, average education, quit rates, and measures of product market power and profitability. Conclude that simple competitive models are not consistent with observed patterns.

■ 4 A further example of the complexity of the subject is that this discussion assumes that most establishments operate within a single industry and their wages reflect the patterns of the industry alone. This is a simplification that abstracts from very real examples. For instance, drug shelf stockers in supermarkets are paid the low wages common to drug stores rather than higher supermarket rates. In these cases, even the establishment is too high a level of aggregation.

While evidence on the source(s) of the differentials remains inconclusive, a strong link between industry differentials and industrial concentration (or profit rates) is found in all studies that search for it (Slichter, Garbarino, Reynolds and Taft, Dalton and Ford, Pugel, and Dickens and Katz), except Weiss. Krueger and Summers find links between differentials and the predictions of efficiency wage models (lower turnover and higher effort).

B. Within-Industry Differentials

Table 3 summarizes a selection of the empirical literature that provides evidence of the existence of large wage differentials among firms and among plants.⁵ The first studies are case studies, where many of the issues explored singly below are investigated for a single labor market. The first two studies are particularly valuable because they use data with unusually rich information on both worker and firm characteristics. Both studies find significant differentials among firms. Reynolds concludes that firms select the general wage level on which they operate until forced to change. Rees and Schultz estimate the individual and establishment effect on wages for four groups of occupations and find systematic differences among firms that are not consistent across all occupations.

Mackay, et al., Nolan and Brown, and Brown, et al. are fairly recent case studies of English and Australian labor markets. They find that wage variation by plant is a large and fundamental component of wage dispersion, and that employer wage differences are persistent over time and are linked to plant performance.

Like the English and Australian studies, Groshen (1988a) focuses on the entire employer differential within industry rather than on the portion associated with a particular characteristic. She finds that a random switch in employer, within detailed occupational category and industry, is associated with an expected wage change of 12 percent. She also finds that employer size, gender composition, and industry sector are associated with wage level. However, it is unlikely that measures of human capital such as experience, tenure, or education explain the observed establishment differentials. Groshen (1988b) finds that these interemployer wage differences are virtually stationary over six years and present within a single metropolitan statistical area. Hodson matches U.S. household survey data with employer information and finds employer characteristics to be strongly significant predictors of wages.

Investigations of employer size and gender composition wage differentials, such as those listed in table 3, are a dimension of the work on employer differentials because they select one aspect of establishment differentials for examina-

tion. The explanations for these phenomena must also come from the theories explored below. The worker-quality differential studies, by Evans and Conant, are of interest because they argue against sorting by ability or human capital.

Finally, the last two intra-establishment studies suggest that although interoccupational differentials are compressed within establishments, they do have the same patterns. Thus, establishment effects are fairly, but not exactly, uniform across occupations.

In summary, these studies provide strong evidence that within-occupation interemployer differentials exist, and that they are associated with measurable attributes of employers, such as firm or plant size.

II. Sources of Wage Differentials Among Employers

This section summarizes five models that explain why an employer might pay a wage premium to all of its employees rather than to particular individuals. These theories are based on the rigorous models of particular economic relationships that have been developed since the 1960s. Virtually all of the ideas in the following discussion can be found in the work of earlier economists, but were later formalized by, and are here referenced to, other authors.

A. The Role of Employers in the Basic Model of Wage Determination

The point of departure for the models of employer wage effects listed below is basic Marshallian supply and demand. I begin by noting that in a perfectly competitive labor market with costless contracting and information, and with identical workers and jobs, no differentials based on differences in labor demand would arise.

Market labor supply is a function of leisure preferences, population supply, and training costs. Market labor demand is the horizontal sum of all employers' demand curves, that is, the marginal revenue product of hours worked. Under perfect competition in capital and labor markets, equivalent workers at equivalent jobs earn the same wage. An employer whose wages stray from the market rate will be forced out of business by loss of employees (wages set too

■ 5 For a survey of the literature and the empirical problems associated with measuring a related issue, the relationship between compensation and firm performance, see Ehrenberg and Milkovich (1987).

T A B L E 3

Authors and Year	Data	Relevant Conclusions
CASE STUDIES AND MORE GENERAL STUDIES OF INTEREMPLOYER DIFFERENTIALS		
1. Reynolds (1951)	Case study of an urban blue-collar labor market based on worker interviews and data published by other sources	Plant wage-level depends on industry, unusual efficiency of plant or management, secure monopoly or oligopoly control of product market, and history of relative wages. Most wage movements occur uniformly within clusters of firms. Plants operate within a range of feasible wage rates, but movement within the band is difficult.
2. Rees and Schultz (1970)	Personnel records from 75 Chicago establishments on 13 occupations, white- and blue-collar, skilled and unskilled; interviews with management personnel and workers	Industry differentials vary in size and sign across occupations, and are smaller for skilled workers. No positive relationship between establishment size and wages, within occupation, industry, location, and controlling for work characteristics. Location differentials are uniform across occupation.
3. Mackay, et al. (1971)	Mean earnings and quit rates by occupation from personnel records for blue-collar workers in 66 engineering plants in Birmingham and Glasgow from 1959 to 1966.	Within occupation, inter-plant coefficients of variation ranged from 16 percent to 23 percent and rank order correlations (from 1959 to 1966) were about 0.9, except for laborers. Wages were negatively correlated with quits, but unrelated to changes in plant size. Investigations of causes led to rejection of sorting by human capital, of random variations, and of working conditions. Concluded that efficiency wages for quit rates and profit-sharing were most likely sources.
4. Hodson (1983)	Wisconsin 1975 survey of high-school graduates from 1957, matched with employer information	Corporate structure variables (size, international links, capital intensity) strongly affect wages. Product market variables (profits, productivity) have little impact.
5. Nolan and Brown (1983)	10-year survey of wage structure for seven occupations in 25 factories in West Midlands, England	Employer effects on wage changes dominate occupation effects. Nevertheless, rankings by employer are relatively stable across occupation over 10 years; rank correlations of 0.8 to 0.9.
6. Brown, et al. (1984)	Survey of 44 occupations in 198 plants in Adelaide, Australia	Overawards to Australian workers tend to be tied to establishment rather than to occupation. Industrial concentration is highly correlated with size of overawards.
7. Groshen (1988a)	BLS Industry Wage Surveys of production workers' wages in six manufacturing industries	Within detailed job classification, wage variation between establishments accounts for 30-60 percent of wage variation, generating a standard deviation of 11 percent. Half of the differentials were associated with characteristics of the establishments (size, union affiliation, etc.).

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Authors and Year	Data	Relevant Conclusions
8. Groshen (1988b)	BLS Area Wage Surveys of nonsupervisory workers' wages (blue-collar and white-collar) in one SMSA for six years	Within detailed job classification, wage variation between establishments accounts for 20-70 percent of wage variation, generating a standard deviation of 12 percent. Differentials were unchanged over six years and not associated with growth or shrinkage.
WORKER QUALITY DIFFERENTIALS, WITHIN OCCUPATION, BETWEEN ESTABLISHMENTS		
1. Evans (1960)	Private area wage and salary survey of clerical workers in Boston	Across establishments, the strongest observed relationship was between wages and length of service. Test scores and education are inconsistent predictors of wages.
2. Conant (1963)	Placement test scores and beginning salaries for typists in Madison, WI	Test scores accounted for only 10 percent of the variation in starting wages offered by different employers to entry level typists.
ESTABLISHMENT AND FIRM SIZE DIFFERENTIALS		
1. Perlman (1940)	BLS Establishment Surveys—Wages and Hour Statistics for six industries	Hourly earnings are higher in large firms, within industry, occupation, product group, and region. Hourly earnings are not affected by establishment size, holding region constant.
2. Lester (1967)	BLS Industry Wage Survey and Census of Manufactures	Except for textiles, apparel and aircraft, earnings increase with establishment size. Differentials increase when fringe benefits are included.
3. Masters (1969)	BLS Census of Manufactures	Plant size variable is a stronger (larger and more significant) determinant of average wage differences among industries than concentration.
4. Buckley (1979)	BLS Area Wage Surveys for 29 areas	Controlling for industry mix, wages rise with area cost of living, but not with establishment size.
5. Miller (1981)	BLS Census of Manufactures	Controlling for industry, wages increase with size of establishment.
6. Personick and Barsky (1982)	BLS National Survey of Professional, Technical, and Clerical Pay 1980	Pay levels tend to increase with employer size, but above-average levels are associated only with large firms. Wage premia attributable to a firm's size are larger for entry-level than for experienced professional workers. Corporate size has better explanatory power for professionals while establishment size does better for clerical workers.
7. Mellow (1982)	Current Population Survey 1979	Both plant size and firm size are positively associated with wages, controlling for personal characteristics and concentration. The effect is proportionately larger when fringe benefits are included. Industry-plant size interaction variables were insignificant.

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Authors and Year	Data	Relevant Conclusions
8. Dunn (1980, 1984)	Independent surveys of employee wages, working conditions, and employer size within one industry	Large firms pay higher wages and shift premia than small firms, except in the highest-paid occupations. Compensating differentials do not appear to be the cause; infers the presence of bargaining.
9. Brown and Medoff (1987)	Variety of public sources	Firm and plant size are associated with higher wages, controlling for occupation, industry, and working conditions. Differentials are smaller for higher-grade occupations.
MALE/FEMALE COMPOSITION OF OCCUPATIONS WITHIN FIRMS		
1. Blau (1977)	BLS Area Wage Surveys	Within occupation, establishments tend to be segregated by sex; pay rates are negatively associated with percentage of establishment female. Occupational segregation by sex is associated with industry.
INTRA-ESTABLISHMENT OCCUPATIONAL DIFFERENTIALS		
1. Ward (1980)	BLS Area Wage Surveys	National occupational wage spreads do not exactly mirror individual firms; pay differentials are smaller within establishments.
2. Van Giezen (1982)	BLS Area and Industry Wage Surveys	Area occupational differentials are larger than intra-firm differentials. Intra-firm differentials vary by industry and region, and decrease with establishment size, although differences are small.

low) or the loss of capital (wages set too high).

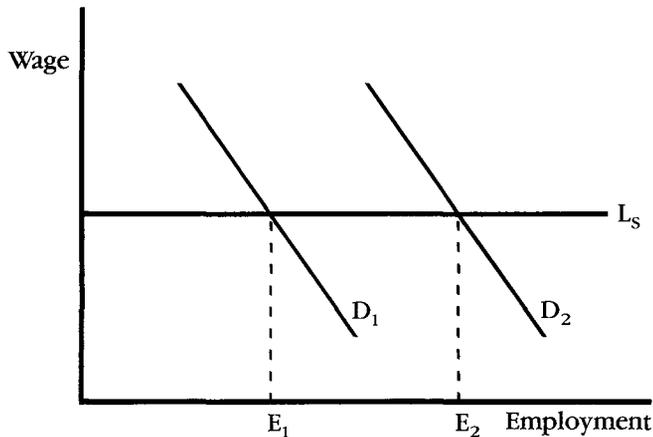
The position that employers are price-takers is the theoretical basis for the current focus on labor supply as the only relevant determinant of wages. The employer in a competitive labor market faces a horizontal labor supply curve, as shown in figure 1. In the figure, Employer 1 has labor demand curve D_1 , which differs from the labor demand curve of Employer 2 (labeled D_2). However, because they face a flat labor supply curve (L_s), the differences between the two employers affect only their employment levels (E_1 versus E_2), not their relative wages. Thus, the simple competitive model generates an empirically testable prediction: variations in labor demand should affect only quantity demanded, not wage level. This is true so long as demand differences do not affect worker utility.

The empirical work summarized above suggests that this simple model does not hold. Wages do vary among employers. In order to

extend the simple model to allow for apparent demand-side effects, any explanation of wage variation by employer must answer two crucial questions: (1) why would one employer choose to pay more than another, and (2) why don't high-wage employers go out of business?

The answer to the first question is usually that a firm paying higher wages employs more productive workers. The advantage of the productivity explanation is that it also answers the second question. The disadvantage is that productivity differentials are usually due to individuals' abilities, not to employers' characteristics, implying the need for more explanation. If productivity differentials are not invoked, costly information or imperfect competition in the product market must be present and, again, operate similarly on all individuals in an establishment.

FIGURE 1



Source: Author.

B. Five Models of Employer Differentials

Table 4 summarizes five microeconomic sources of wage variation. Each source is developed from the competitive model by the introduction of transaction costs and/or of heterogeneity among agents. The table also lists the basic assumptions beyond those of the competitive model, and the additional assumptions necessary for the models to predict the existence of apparent *employer wage* differentials, rather than differentials among individuals or among occupations.

Each of the models examined predicts the existence of wage dispersion, and can be extended to predict employer-based dispersion, though the extensions usually involve extra twists of varying plausibility. Although none of the five models relaxes the assumption of profit maximization on the part of employers, they are arranged in order of their divergence from competitive theory in other aspects. In particular, the last two models, efficiency wages and bargaining, require assumptions of imperfections or lack of competition in the product or labor markets because they imply the existence of job rationing or queues for high-wage employers.

1. Sorting by Ability: Innate Differences, Human Capital, and Matching

The first two explanations relax the assumption of uniformity among workers or jobs in the market. Since the labor market is perfectly competitive, workers earn the marginal product of their work and employers pay equivalent wages per efficiency-unit of work. However, hourly wages may mismeasure either the workers' units of work (because this varies among workers) or their compensation (because it omits non-pecuniary returns to employment). In order to generate *establishment* differentials rather than just *individual* differentials, the theories must also explain why the marginal product of workers varies among employers.

Sorting models assume that some workers are more productive than others, and employers consistently hire their workers from a single quality stratum, regardless of occupation. The source of quality difference may be innate advantages (for example, genetic or motivational), or acquired differences (for example, education or work experience). Each establishment hires only the best, or only the worst, workers of each job category.

A priori, it is not obvious why an establishment would need or choose to segregate by ability. If all workers were paid their marginal products, the number of workers paid to produce a certain product should be irrelevant. For example, employers should be indifferent between two equally productive workers at one wage and a single doubly-productive worker at twice the wage. Any establishment could have a distribution of productivity levels (all rewarded accordingly) within each occupation. In this sort of world, no apparent establishment differentials would arise.

In order for innate or acquired productivity differences to generate apparent establishment differentials, employers must choose workers of fairly uniform productivity within occupations, and apply this policy similarly to all occupations. That is, this theory must be combined with an explanation for segregation by firm. Two questions arise: why and how?

The most convincing reason may be that employers' technologies are differentially sensitive to a worker's ability. In this case, employees of high ability who are not being rewarded for their higher ability by employers with ability-insensitive technology have an incentive to seek out employers who will pay according to ability. This leads to a positive correlation between the

ability-sensitivity of the employer's technology and the average quality of their applicant pool. Thus, employers with ability-sensitive technologies hire disproportionately more high-ability workers and, therefore, pay higher wages.⁶

For example, establishments requiring technical typing are likely to be highly sensitive to the skills of typists. So, we expect such employers to reward an excellent technical typist more than would employers who needed only text

T A B L E 4

Model	Wage Equation ¹	Costly Factor(s)	Source(s) of Heterogeneity	Additional Assumptions Necessary for Existence of Employer Wage Effects
SORTING BY ABILITY				
Human Capital, Innate Differences, Job Matching	$w = MP$	Training	Innate or acquired worker quality, quality of job match	Establishments differ systematically by average quality of workers, or match, consistently across all or most occupations.
COMPENSATING DIFFERENTIALS				
Working Conditions, Fringe Benefits, Risk of Layoff	$w = MP$	Improvement of undesirable terms of employment	Management strategies or technologies	Undesirable terms of employment are uniform across all or most occupations within establishment.
RANDOM VARIATIONS				
Information, Search, Lagged Adjustment	$w = MP + \epsilon$ $\epsilon \sim f(0, \sigma^2)$	Employer and/or worker search, job mobility	Random draws from the pool, intertemporal wage variation	Employers vary in the average value of their draws, employers hire for all occupations during growth surges.
EFFICIENCY WAGES				
Monitoring, Turnover, Market Insulation, Corporate Consistency, Morale, Loyalty	$MP = f(w) \rightarrow$ $w^* = MP^*$	Monitoring of workers' effort, turnover, design of internal wage structure, firm-specific training	Management strategies or technologies, corporate size	Employers adopt similar strategies (or technology has a similar effect) on the efficient wage across all or most occupations, workers in most occupations develop firm-specific training.
BARGAINING				
Insider/Outsider, Rent Capture, Gain-Sharing	$w = MP + f(\pi, \text{workers' bargaining power})$	Monitoring of workers and/or of management	Varying rents, ability of workers to capture rents, and/or managerial altruism	Rent capture is achieved and/or shared by all or most occupations.

■ 1 The symbols in this column are defined as:

w = wage

MP = marginal revenue product

ϵ = random error term, distributed with mean of 0 and variance of σ^2

$f(*)$ = some function of *

w^* , MP^* = the unique profit-maximizing values of w and MP

π = profits

typing. The higher pay for skills will, in turn, attract other typists with technical skills into the applicant pools for employers needing technical typing. In order to create establishment differentials, this explanation must be expanded by the assumption that ability-sensitivity in establishments is highly correlated across occupations. Otherwise, wage variation would occur primarily by occupation within establishment, not by establishment across all occupations. Thus, in the example, the need for technical typing must be associated with ability-sensitivity in other occupations.

The second explanation is not mutually exclusive with the first and could provide a rationale for the correlation in ability-sensitivity across occupations. This model assumes that variation in the quality of workers in an establishment imposes negative externalities on the productivity of more able workers. Envision establishments as assembly lines where work stations are indivisible, or where the timing of the output depends on the speed of the slowest operative. Then, the productivity of the slowest worker determines the productivity of all the workers. As workers seek their best-paying job, establishments become segregated by quality.⁷ Employers maximize profits by hiring or retaining (through their recruitment and termination policies) only those workers at least as able as those in their existing work force.

Job matching provides another approach within the sorting models (Jovanovic [1979]). Here, both worker and employer are uninformed about the worker's productivity in a particular job, until both have experienced it. The productivity of a worker-job combination is random, with a distribution known to both sides. Workers accept jobs that pay more than their current jobs. Employers offer wages based on the mean of the distribution, and later adjust wages to reflect measured productivity. Accuracy of productivity measurement improves as

tenure increases. Employees with bad matches eventually leave in hope of finding a better match elsewhere. Then differences in the distribution of productivity across employers could lead to sorting.⁸

Other explanations for sorting come from the sociology literature on the joint productivity of teams as a product of the uniformity of team members. In all versions, all employers (whether high- or low-wage) earn zero or equal profits in equilibrium. But, high-wage/high-productivity employers are not associated with higher or lower profit levels than their low-wage/ low-productivity competitors. Only consistency matters.

The human capital model, formalized by Becker (1964) and Mincer (1974), provides a rationale for the variance of wages according to acquired training. Training increases productivity, raising the demand curve for hours of trained persons' time over that for untrained people. However, the costs of training, such as forgone wages and tuition, raise the supply curve for trained persons' time. Thus, the price of trained labor is higher than that of untrained labor and reflects the difference in marginal product between the two.

If human capital differences are manifested as employer differentials, employers must be able to predict productivity on the basis of acquired training (education and seniority), and both hire and pay workers accordingly. High-wage employers are such because they select the most highly trained workers in each occupational category. Low-wage employers hire (or end up with) workers with the least training across the board.⁹

Innate differences in productivity (for example, due to perseverance, or motivation) are less amenable to measurement by all parties, and are not included in the data bases generally available to economists. As such, they can only be investigated indirectly. However, if these innate qualities

■ **6** Models of self-selection and sectoral choice where the sectors vary in returns to ability in a competitive labor market were introduced in Roy (1951). A more recent treatment appears in Lang and Dickens (1987).

■ **7** When an employer pays wages that reflect actual marginal product, workers will be paid the marginal product of the least-productive worker, rather than according to their own individual abilities. Workers with higher potential will leave for jobs with a more productive "weakest link", causing average potential productivity to decline toward that of the least-productive worker. Employers who pay workers according to their potential marginal product will keep their workers, but lose money. This argument is similar to the "Jobs as Dam Sites" idea introduced in Akerlof (1981).

■ **8** For instance, suppose that all jobs had the same expected productivity, but those offered by certain employers had a higher variance. In this case, the high-variance employers might tend to have a high-wage, more-productive work force. This would happen because the workers with the good draws would stay longer and the workers with the worst draws would leave more quickly than they would in a firm with less variance.

■ **9** One explanation for sorting by establishment applies only to a particular form of acquired human capital: work experience. High-wage establishments may be older and have a relatively old, experienced work force, compared to the younger, less-productive workers in low-wage plants. If so, differences in age of employer would be reflected in wages, although wage per efficiency-unit of work is identical for all employers.

are correlated with the usual measures of acquired human capital such as age and experience, then controls for measures of human capital also control for innate differences.¹⁰

Conant (1963), Evans (1960), and Groshen (1988a) all suggest that employer wage differences are not associated with sorting by measured human capital or by ability correlated with human capital. Gibbons and Katz (1987) suggest that the unmeasured ability explanation also faces a number of empirical problems in addition to high correlation in employer differentials across occupations. One problem is the lower quit rates in high-wage firms and industries, which suggests that the high-wage jobs may be rationed, unless high ability has a particularly strong association with a tendency for employment stability. Another problem is that workers displaced from high-wage industries do not appear to retain their wage differentials if they switch industries. Finally, the correlation of employer wage differentials with product market power is difficult to explain within this model.

2. Compensating Differentials

The second possibility is compensating differentials, described by Adam Smith (1776), refined by other economists since then, and summarized in Smith (1979). The essential problem is mismeasurement of the total return to working. In the case of poor working conditions, monetary wage overstates the returns to individuals for their work because it ignores the extra costs imposed by working conditions.

Working conditions vary among employers, and it is costly to improve them. All else equal, workers prefer jobs with safe or pleasant working conditions to those with poor conditions. Thus, employers providing unfavorable conditions will be unable to meet their labor demand at the going wage. In response, the firms offering undesirable jobs must improve the working conditions or raise wages, whichever costs less. If improvement of conditions is costly, wages will be higher in order to attract sufficient labor, but the profitability of each hour worked is higher because of money saved during each hour worked under poor conditions.

If workers were identical, the wage differential between any two jobs would ensure that

workers were indifferent between the two. If workers varied in their tastes, the differential would depend on the tastes of the marginal worker. The allocation of the work force among poor and good jobs depends on the assumptions made about existing production technologies. Technology is usually assumed exogenous, so we need a random distribution of differences in costs of improving conditions. If technology is not exogenous, all firms will choose the one that maximizes profits, so only those combinations of technologies and compensating differentials that yield the maximum profits will coexist.

In all versions of this model, employer (rather than individual) differentials arise only when quality of working conditions is consistent across all or most of the work force in establishments.¹¹ Many working conditions, such as physical exertion, do not apply because they are occupation-specific. However, high risk of layoff, poor ventilation, minimal fringe benefits, or inconvenient location could presumably affect all or most workers in an establishment. Then, the costs of improvement of these conditions must vary enough among employers to generate the large and persistent differentials.

Empirical studies of compensating differentials have been notably unsuccessful in finding evidence of their contribution to wage dispersion.¹² One exception to this generalization is Eberts and Stone (1985), who find evidence of compensating differentials only after controlling carefully for characteristics of employers, suggesting that compensating differentials are second-order effects. That is, type of employer determines overall level of compensation, but there is some substitution between wages and nonpecuniary compensation within groups of otherwise similar employers.

■ **11** In addition, two fairly mechanical versions of compensating differentials are possible. The first is based on different age-earnings profiles with differing average tenure among plants. The second is variation in timing of annual salary adjustment. Groshen (1988a) presents evidence that suggests that neither of these possibilities is likely.

■ **12** For example, see Smith (1979). Most studies have attempted to identify compensating differentials among industries, where conditions vary most among employers. Nevertheless, such inquiries have been marked by their lack of success. For working conditions, see Brown (1980); for layoff risk, see Topel (1984). It is also unlikely that employer wage differences compensate for differences in fringe benefits. Freeman (1981), Smith and Ehrenberg (1981), and Atrostic (1983) find that inclusion of fringe benefits exaggerates wage differences among employers. That is, high-wage employers pay even more of total compensation in the form of fringe benefits than do low-wage employers.

■ **10** Job market signalling (Spence [1973]) is an extreme example of this type of correlation, which blurs the distinction between human capital and innate differences.

3. Random Variations

Seminal articles by Stigler (1962) and Rothschild and Stiglitz (1976) launched a family of pure information models that use costly job search to explain wage dispersion. Suppose search were expensive for job-seekers. In this case the marketplace can sustain a range of wages because the gain from further search becomes uncertain, rather than a known quantity.¹³

In the typical model, establishments offer wages according to a distribution known to all job-seekers. Workers accept offers that exceed the expected value of further search. Job-rejecters pay to search again. Thus, the only sustainable distributions of wages are those where the minimum wage paid differs from the mean offer by less than the costs of employee search.

These models focus on the role of the individual in wage determination. No rationale is offered for variations among employers. A symmetric formulation of the problem from the employers' point of view posits the existence of a known distribution of reservation wages among a population of potential employees. Employers interview applicants to ascertain their reservation wages, and jobs are offered to workers (at their individual reservation wages) when the expected value of the wage reduction from an additional interview by the employer falls below the employer's search costs. Employer search costs consist mainly of advertising and interview expenses.

The employee-cost/employer-distribution model provides no theoretical basis for the existence of employer differentials. Rather, it explains only persistence of variance, leaving unanswered the question of why the employers who pay over the mean do not reduce their wages.

The converse model, the employer-cost/employee-distribution model, abstracts from the fact that firms usually set wages for a job rather than for an individual. Indeed, wages are usually attached to jobs before the interviewing process. Exceptions to this rule occur where job responsibilities are not well-defined, such as in very small firms and for highly skilled or very senior employees. In general, two individuals who differed only in reservation wage would

■ **13** Originally, the information models were formulated to explain the existence of price or wage dispersion. Subsequent work uses these ideas to predict the level of unemployment. For example, see Azariadis (1983). Since the focus of the current work is wage dispersion, the earlier formulations of Stigler will be used to characterize the results of this diverse literature. Later versions of these models generate terminal wage distributions from initially assumed distributions. Stiglitz (1979) and Venables (1983) provide examples of these models.

not be offered different wages at the same plant.

Lagged adjustment, a second type of random variations model, is not inconsistent with the information/search models, but provides a basis for the variations (wage shocks) and an additional reason for their persistence (internal adjustment costs). These models, coined "geological models" by Dunlop (1982a), focus on the employer. Establishments may tend to hire in surges rather than in steady flows. If the costs of redesigning an internal wage structure are high or if workers are immobile, a firm's internal pattern and general level of wages will reflect the market wage pattern of its most recent expansion.¹⁴

In the random variation models, wages approximate the worker's marginal product, but costs of information introduce an error term. The mean of the error term is zero, and its variance is a positive function of the search and mobility costs for one or (perhaps) both parties. Consequently, establishment differentials result from random variations in the average error terms of employers. But, if establishment differentials are large, long-lived, and associated systematically with characteristics of employers—as suggested by the empirical work cited above—they are not random variations.

4. Efficiency Wages

Efficiency wage arguments posit a causal relationship between the wage level and a worker's on-the-job productivity.¹⁵ Efficiency wage employers maximize profits by paying workers a premium above the market-clearing wage, because the resulting increment in productivity yields the highest profits. The increased productivity has been modeled as coming from three

■ **14** For example, establishments may grow by the addition of a second or third shift, rather than by hiring a few new workers each month. Wages at the time of a hiring surge reflect current labor-market conditions. If the market is tight, wages paid to attract new employees will be relatively high. Later, when market wages fall, adjustment down to the new market-clearing level will not be immediate. Redesigning the internal wage structure imposes costs (out-of-pocket and morale) on the employer. Wage schedules are rarely adjusted more often than annually and are rarely adjusted downward nominally. Upward adjustments will be slow if workers face mobility costs. Thus, the internal pattern and general level of wages at any particular time reflects the market wage pattern of the employer's most recent expansion. (Hence, the term "geological.")

■ **15** The main versions of these models are summarized in Yellen (1984) and Stiglitz (1984). Efficiency wages were originally formulated as an explanation for equilibrium unemployment, rather than for wage dispersion. Wages do not fall to clear the market because firms maximize profits in a labor market where wages are high and jobs are rationed.

sources: reduced monitoring (or shirking) costs, decreased turnover, and sociological considerations. The internal labor market literature adds two more possibilities: market insulation and corporate consistency.

In the monitoring/shirking version, workers' effort is costly to monitor (Bulow and Summers [1986], Shapiro and Stiglitz [1984]). An increase in wages decreases a worker's incentive to shirk, because shirking increases the probability of losing a high-wage job. In comparison to an employer paying the equilibrium wage, efficiency wage employers pay higher wages, experience higher worker productivity, and have lower direct monitoring expenses.

The turnover version emphasizes employer costs of hiring and training (Salop [1979]). Wages above equilibrium reduce turnover because workers have fewer superior alternatives and/or because the general level of unemployment rises. Thus, workers paid higher wages have longer tenure. Two related search/recruiting versions of the model show that firms with high costs of unfilled vacancies will offer high wages to more quickly fill vacancies (Lang [1987] and Montgomery [1987]).¹⁶

A third variant of the argument is based on sociological morale, loyalty, or teamwork effects. Group work norms are raised by wages above the minimum required. Akerlof (1982) terms this the "partial gift exchange" model.

The two internal labor-market variants, as described by Doeringer and Piore (1971), focus on the out-of-pocket and morale costs of designing a compensation package for a group of employees, and on firm-specific human capital. If all wages are to be set constantly at market-clearing levels, shocks to the external labor market will necessitate periodic readjustments of internal pay relationships. Yet, redesign of wage schedules may be expensive for certain types of employers, especially large ones, or for certain groups of employees, such as incentive workers. In addition, any change in relative wage relationships may be perceived as inequitable or as a breach of implicit contract. Such dissatisfaction could reduce productivity through increased shirking or turnover.

An alternative to frequent, disruptive adjustments in response to market fluctuations is to

set wages above the market level. If, on average, workers receive a premium, then wage shocks that are small relative to the premium will not force a firm to readjust its compensation package. Employers save out-of-pocket and productivity costs of the adjustment, in return for paying higher wages.

Corporate consistency, the second internal labor-market version, is based on the tendency of large firms to promote workers from within whenever possible rather than hire from outside. Presumably, firm-specific human capital makes promotions or transfers among plants efficient. Nevertheless, such a policy requires that internal wages for each occupation in each plant meet two criteria: (1) they cannot be much lower than local wages for the occupation (or the workers will leave the firm), and (2) they cannot be lower than firm-wide wages for that occupation (or workers will refuse transfers to the plant). This implies identical wage structures for each plant within the firm regardless of location, as long as product lines are similar enough for personnel to be transferred among them. Furthermore, each occupation will earn the maximum local rate over all plant locations. On average, this yields positive establishment differentials that increase with firm size.

Efficiency-wage models can be invoked to explain differentials among firms in two ways. First, the profit-maximizing point is, almost by definition, locally flat. This implies the existence of a plane of (almost) iso-profit wage-productivity points for identical firms. That is, variations in wages from the optimum lead to only small profit losses. Firms are close to indifferent among the possible combinations, so a random distribution of strategies results (Bulow and Summers [1986]).

A second, more plausible, explanation stems from economically important heterogeneity among employers: differences in technology (vintage effects, for example), or differences in products (such as differentiated quality niches). The productivity of workers at the market-clearing wage may be indistinguishable from high-productivity work under some technologies, or may be adequate for one market but not for another. Workers paid the market-clearing wage form a queue for jobs at the elevated wage, while recipients of the high wage avoid job loss or job changes because of the scarcity of equivalent opportunities.

Efficiency differentials can explain establishment differentials when workers in all or most occupations in the establishment are affected. That is, it is crucial that the heterogeneity among employers affect the efficient wage for all

■ **16** Lang (1987) extends the analysis to show that an equilibrium distribution of wages can be sustained among otherwise-identical firms, but there is no reason to expect firms' positions in the distribution to persist, unless firms lock in their position by their choice of technology. This assumes the existence of a range of technologies, each with different capital-intensity (and, thus, cost of unfilled vacancy).

occupations similarly. The plausibility of this assumption depends on the version of the model in question.

Few empirical tests of efficiency wage models have been performed, primarily because of the lack of appropriate data. One recent exception, Leonard (1987), finds little evidence to support the turnover or supervisory-intensity versions among electronics companies in California. Another study, Krueger and Summers (1986a) finds some support for efficiency wage explanations of interindustry wage differentials. Interest in these models suggests that the results of other tests may be available shortly.

5. Insider/Outsider Bargaining Models

When bargaining between workers and their employers takes place in the context of competitive markets (in labor, capital, and products), bargained wages cannot differ from the market-clearing wage. Otherwise, the firm would close or the workers would leave. However, if employees can exercise a claim on the rents generated by an enterprise, they will bargain (implicitly or explicitly) with their employers. Wage settlements will reflect both the size of rents and the relative bargaining power of the parties. Thus, the existence of both rents to the firm and employee bargaining power are necessary conditions for wage bargaining to produce wage variation.

Although all versions of bargaining models must assume the existence of rents, the models differ in the identity of the bargaining agents and in the enforcement mechanisms for the bargaining. The bargaining agent for the workers is most clear in the case of unionism. In the collective bargaining literature, the outcome of negotiation is likened to the Edgeworth Box. Bargaining is a positive-sum game until the contract curve is reached, and a zero-sum game along the contract curve. The outcome is determined by the relative bargaining ability and credibility of participants' threats. The range of possible wages is bounded by the market-clearing wage on the bottom end and by the worker's actual marginal product (with labor appropriating all rents and capital earning the normal rate of return) on the high end.

In a nonunion setting, the bargaining agent for the workers is not obvious. However, economists have long noted the existence of informal organization by workers in nonunion settings (Dunlop [1957]). One version is the union-threat effect, where the threat of unionization forces

owners to provide nonunion workers benefits similar to those they would receive if unionized (Dickens [1986]).

In a second version, the managerial-capitalism or agency-cost version, managers act as mediators between labor and the owners of capital. If the rewards to management are not highly correlated with rents to the owners, or if managers maximize a utility function dependent on worker satisfaction (whether due to managerial altruism or to the ability of workers to impose on-the-job problems), then management may not act to maximize rents to owners. Implicit bargaining may occur, with management cast in various roles from agent for the workers, to mediator between the two sets of interests, to agent for the owners. The latter role would generate a model all but institutionally indistinguishable from a union bargaining model. For example, Aoki (1984) presents cooperative bargaining models for modern nonunion corporate enterprises with various constituencies. Edwards (1979) also presents an informal model of nonunion bargaining.

Bargaining models easily lend themselves to the prediction of establishment differentials. The only additional assumption necessary is one that binds together workers of different occupations in the establishment. Three possibilities exist. First, workers' bargaining power may be consistent across occupations in an establishment. Second, perhaps workers must form large groups in order to exert bargaining power. Third, managerial altruism may extend uniformly across occupations.

The persistent link between measures of product-market power and industry wage differentials provides an empirical basis for further investigation of bargaining theories. More direct evidence is limited by the lack of data, but studies by Abowd (1985) on unionized firms and by Kleiner and Bouillion (1987) on both union and nonunion firms provide some support for bargaining hypotheses.¹⁷ As with efficiency wage models, more direct tests of these models are certain to be available in the near future.

■ 17 Abowd (1985) finds evidence that union contract settlements diminish the value of the firm by exactly the change in the value of the negotiated settlement. Kleiner and Bouillion (1987) find that firms' wages are strongly positively correlated with the provision of sensitive financial information to employees.

III. Labor Market Policy and Employer Wage Effects

The empirical work cited in this paper suggests that employer wage differentials are large. Thus, they may account for many of the observed inequalities in the labor market, such as those among races or between men and women. Exploration of five models of employer differentials clarifies the point that these differentials are not necessarily inconsistent with profit maximization by firms acting in a competitive labor market. Yet each model suggests the existence of a particular barrier that prevents formation of a single market wage.

The link between theories of employer wage effects and labor market policy to reduce income inequality is labor-market segmentation.¹⁸ When labor markets are segmented, workers are separated into distinct markets by institutional barriers that prevent workers or employers from switching between markets. Thus, different wages persist for each sector of the labor market. Although workers in each sector are paid their marginal product, productivity varies between sectors according to sector-specific supply and demand, or sector-specific quality. Obviously, the costs of barrier removal must be high enough to prevent profit-seeking employers from eroding the differences between sectors.

Employer differentials will create segmented markets only if employers limit their recruitment to one sector, so any model must explain why employers hire all (or most) of their employees from the same market sector. Each model discussed above introduces a barrier that could create segmentation, with strikingly different policy implications. Thus, it is precisely the identification of the source of the barrier that makes segmentation difficult to cure with policy.

For example, under the sorting model, segmentation will arise if workers of different sex or race have different access to human capital. The model implies a need for the development of human capital among secondary sector workers (for example, lower cost, better education, or job training). Alternatively, compensating differentials imply no role for policy, since the market actually remunerates all workers equally. Apparent segmentation arises simply because tastes

differ systematically among groups.¹⁹ Random variations suggests that search costs are higher for the classes of workers in predominantly low-wage jobs. A possible solution may be expansion of job-service agencies targeted to these groups.

Efficiency wages and bargaining imply the existence of queues of workers for high-wage jobs. Thus, any attempt to reduce inequality should rest on regulation of employers' recruitment policies, on improvement of placement services for secondary market workers, and on elimination of any minor productivity deficiencies among workers in the secondary sector.²⁰

These five theories of wage determination also diverge from each other in their predictions for the impact of other kinds of policy. For example, Stiglitz (1984) and Bulow and Summers (1986) analyze the effects of efficiency wages on macroeconomic performance and trade policy. Weitzman (1986) offers an analysis of the effects of a particular form of profit-sharing on economic stability and growth.

Understanding the source of employer differentials is clearly important for understanding the distribution of wages, and for formulating policy to affect it. New sources of data must be developed to allow research on employer activities such as supervision, recruitment, terminations, and wage-setting. Without further research on these topics, we will remain unable to sort out whether employer wage differentials are signs of inefficiency, of discrimination, or of other market imperfections.

■ **18** For a summary of the literature on segmentation, see Cain (1976) and Dickens and Lang (1985). Lang and Dickens (1987) provide a detailed investigation of the relationship between the literature on segmented markets and neoclassical economic theory.

■ **19** For instance, compared to men, women may prefer quieter, cleaner, or more flexible jobs (Filer [1983]).

■ **20** Bulow and Summers (1986) demonstrate how efficiency wages may be a source of market segmentation. They emphasize that segmentation requires the existence of a small productivity differential between workers of the two sectors, but that the wage difference between the two sectors will be far greater than the productivity difference. A similar argument can be made for differentials associated with rent-sharing, assuming profit maximization on the part of employers.

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