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The Rise and Decline (?) of U.S. Internal Labor Markets

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Abstract

Many employers adopt practices that insulate their workforces from the outside labor market. One defining characteristic of such an "internal labor market" is a company wage policy that diverges from that of the external market. These divergences may occur for an entire employer on average, or for a subset of occupations at an employer. This paper examines the changing magnitude and persistence of both types of divergence over the last 40 years. We analyze a unique salary survey with detailed microdata on the pay practices of 228 large Midwestern employers. This long time period (the longest extant on a large number of employers) permits an evaluation of the supposed "golden age" of internal labor markets, as well as any recent decline. The results also shed light on several theories that attempt to explain increased pay inequality.

We find no evidence of a recent decline in the importance of internal labor markets in large firms, as measured by the magnitude or persistence of deviations in company wage policies from market averages. Moreover, employers in industries that underwent deregulation or that experienced rising imports did not systematically weaken their internal labor markets.

1. Introduction

Readers of the business press are constantly reminded that long-term commitments between employees and firms have largely ended in the U.S. Markets increasingly dominate and employers' "internal labor markets" (that is, the set of practices that insulate their workers' jobs and wages from the external market) are in decline.

Meanwhile—in stark contrast—readers of the academic literature know that most empirical evidence indicates little change in average tenure, with modest declines in tenure for some groups matched by increasing tenure for others.[1] This article examines whether declines in the wage (i.e., price) dimension of internal labor markets (ILMs)—the complement of the job (i.e., quantity) side of the employment relationship—might explain the apparent dichotomy between public perceptions and the previous empirical results. For example, in a classic ILM, a large employer might pay persistently high wages on average to all of its employees, and also pay a subset of occupations even higher wages. In that case, a clear signal of a declining ILM would be diminished size or persistence of these differentials over time. Such changes might well affect behavior and attitudes without being reflected in average tenure or displacement rates.

This article analyzes the Cleveland Community Salary Survey, which includes detailed microdata on the pay practices of 228 large Midwestern employers from 1955 to 1996—making it the longest continuous data set with such information. We examine changes in the variance and persistence of wage differentials within and between these employers.

This exercise is not intended to test theories of wage determination, since most theories are compatible with at least some of the pay differential patterns we observe. Rather, our results shed light on theories of ILMs, with implications for understanding the sources of rising wage inequality in the U.S. In particular, we compare the changes we observe with those predicted by human capital interpretations of the recent rise in wage inequality. We also test for ILM changes in industries with declining product-market rents due to deregulation or rising imports.

There are several reasons why it is important to understand ILMs. First, the kind of employers that traditionally used ILMs (that is, large firms and government agencies) form an important part of the US labor market, and show no signs of shrinking their employment share.

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[1] See, for example, Diebold, Neumark and Polsky (1997). The current state of the academic literature on changes in job stability can be found in a forthcoming edited book (Neumark 1998).

The share of total nonfarm employees that work for government or employers with more than 1,000 employees is large (52.2 percent in 1992) and has remained almost constant over the last 20 years.[2] The long time period we analyze permits an evaluation of the historical description of a "golden age" of ILMs in the 1960s and 1970s, as well as any recent decline.

Second, at a time when ILM research has "Too Many Theories, Too Few Facts" (Baker and Holmstrom 1995), descriptive data are crucial. Third, understanding ILMs is also crucial for understanding whether rising pay inequality stems more from increasing variation for people who remain at a single employer, or for those who changed jobs (Gottschalk and Moffitt 1994). Finally, several influential commentators on monetary policy have posited that declining ILMs may now constrain wage hikes to be less than or equal to underlying productivity growth.

2. Theory

We first outline and illustrate what we mean by ILMs, and discuss theories of their existence. We next discuss the theory and evidence for changes in ILMs in recent decades.

2.1. What are internal labor markets?

No single definition of ILMs exists. However, the description in Doeringer and Piore's (1971) classic *Internal Labor Markets and Manpower Analysis*, includes following features: long-term commitments between employers and employees, defined career paths, limited ports of entry for each career path, wages tied to job (rather than personal) characteristics, and pay structures that exhibit rigidities across occupations and time.[3]

ILMs, as described by Doeringer and Piore, place high emphasis on custom and history. They adopt personnel procedures that award occupations identical percentage wage raises over time, which ensures that relative wages across occupations remain largely rigid. Doeringer and Piore also observe that ILM wage structures are created by company-specific job evaluation

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[2] This calculation combines data on private sector employers with more than 1000 employees from the Bureau of the Census's Enterprise Statistics with data from the Bureau of Labor Statistics on government and total nonfarm employment.

[3] Doeringer and Piore drew on a long-standing tradition; see for example, Lester (1948); Dunlop (1957); and Livernash (1957). More recently, several scholars have used microdata to search for other testable implications of ILM theories. For example, Baker, Gibbs, and Holmstrom (1994) find that labor market conditions at time of hire affect employees' wages for many years. Lazear (1995) finds that observable characteristics of job incumbents do little to help predict which jobs are part of long career ladders.

processes that reward some jobs or groups of jobs more heavily than their counterparts in the external market.

Our data allow us to focus on two dimensions of pay practices within ILMs: the tendency for some employers to pay all employees (on average) more or less than the market wage, and the tendency for some employers to pay a particular subset of employees particularly well or poorly compared to both their occupation and the employers' average compensation level. We refer to the first measure as the "employer (wage) effect"; the second, we call the "internal (wage) structure effect." We characterize these two measures of ILMs as "important" when they have a high standard deviation; for example, companies pay apparently similar workers very different wages. We also examine the persistence of these and occupational wage differentials over time.

As an example of the role of ILMs, consider Kodak—which has long been a leading US employer in creating and enhancing ILMs (Jacoby 1997). From the 1930s on, Kodak has been a high-wage employer. That is, employees who take jobs at Kodak typically receive a large wage increase compared to their previous job. If Kodak were in our data set, it would have a high employer wage effect.

While Kodak pays high wages on average, it also pays its production employees even more in relative terms than it pays nonproduction jobs—enough to exceed the typical wages of unionized workers in Rochester (Jacoby 1996). The high wages stem partly from fear of unionization, but also from the high level of responsibility borne by Kodak's production employees; even a single tear in photographic paper can be very costly.

In the 1990s Kodak made headlines not for its classic ILM, but for its decline. "Big Yellow" laid off tens of thousands of employees (Richman 1993), something it had avoided even during the Great Depression. An important question is whether the wage rigidities associated with ILMs such as Kodak's declined at the same pace as the long-term employment commitments did.

2.2. Theories of internal labor markets and their possible decline

For the first decade after Doeringer and Piore's classic work, economists had too few models to easily incorporate their insights about ILMs into mainstream theory. Today, the situation is reversed. Various features of ILMs have been modeled as serving the following

functions: to share risks (Baily 1974; Bertrand 1997); to provide tournament incentives (Lazear and Rosen 1981); to create incentives via delayed compensation (Lazear 1981; Becker and Stigler 1974), threats of dismissal or other efficiency wage effects (Shapiro and Stiglitz 1984; Levine 1992), or fairness (Akerlof 1984); to motivate acquisition of firm-specific human capital (Becker 1975), particularly when concerns about "hold-up" are serious (Malcomson 1997); to encourage senior employees to train junior employees; to alleviate problems of collusion (Milgrom and Roberts 1990) or bargaining (Williamson 1975) between employees and managers; to select for valued characteristics, such as stability (Salop and Salop 1976); and to share rents (Groshen 1991a; Carruth and Oswald 1989). Less neoclassical theories note that ILMs may promote perceptions of procedural justice and (if historical relative wages become accepted as normal) distributive justice (Doeringer and Piore 1971).

At the same time that theories of ILMs have proliferated, the business and management press has proclaimed their demise.[4] For example, James Annable (1997), a prominent business economist, observes that historically "explicit and implicit contracts evolved over time guaranteeing... established wage differentials." In contrast to this historical pattern, he maintains that internal relativities have become less rigid: Now "managers are increasingly willing to change wage differentials, especially to isolate skill groups that are in short supply." Moreover, between-company relative wages have also become less rigid: "Companies are breaking away from formal and informal cost-of-living arrangements as annual wage increases give way to performance awards, often linked to the corporation's equity price."

Complementing these claims, certain evidence suggests that the importance of ILMs may have declined for some types of workers. For example, during the last 15 years, the long-term employment commitments that many large American employers had to middle-aged men, particularly middle managers, appears to have declined (Farber 1996; Rose 1995; Valletta 1997). Perhaps overstating the case, the New York Times (1996) published a prominent series of reports on downsizing, emphasizing the destruction of long-term commitments between employees and

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[4] Examples include statements of "The end of traditional notions of corporate loyalty" (Kiechel 1987 in *Fortune*), "The new employment contract," (Kissler 1994, in *Human Resource Management*), "The dramatic breakdown of [the] tacit agreement [to] exchange of hard work and loyalty for security (Cashman, Kevin; Feldman 1995 in *Executive Excellence*), and "Dramatically changed, and in many cases destroyed... employment relationships" (Burack and Singh 1995, in *Human Resource Planning*). These and many other articles identify less stable and more market-related compensation patterns as a key part of the new employment relation (e.g., Cappelli 1995; Kanter 1987; Manicatide and Pennell 1992; and Stiles, et al. 1997).

employers. In union settings, much has been made of the decline of pattern bargaining—although this finding has not found consistent support in the research literature (see Erickson 1996; and Ready 1990.)

The stories being told about the demise of ILMs have a number of different components and variants. In order to compare them, below we summarize the main theories of ILMs and their demise, and then consider implications for observables. Table 1 summarizes these observations and makes it clear that these various stories are neither mutually exclusive nor consistent in their predictions.

Spot market: Many models posit that firms maintain ILM practices in order to develop and retain job-specific human capital. Limited ports of entry, high rigid wages, and idiosyncratic, back-loaded pay structures all discourage turnover. Some analysts argue that employer-specific human capital has become relatively less important lately because recent technological advances render job-specific skills less important, or a faster pace of product cycle or technological changes has had the same effect. Then, general human capital (which is inherently more flexible than specific skills) has become more important to production processes. Thus, because flexible workers hired from outside can be productive immediately in non-entry-level jobs, policies to retain insiders are less cost-effective. These changes foster general dissolution of ILMs in favor of spot markets for labor.

Such a general decline in ILMs would have clear implications for employer and internal wage variations and rigidities—which represent idiosyncratic returns to specific human capital and worker stability in this story. If these traits are less valued, then the variation and persistence of employer and internal structure differentials should decline. In addition, the persistence of occupation differentials in firms with ILMs should decline, as employers no longer shield workers from external market forces. However, occupational and individual wage variation should rise, as these differentials pick up increased market returns to general human capital.

Ability to pay: Rentsharing and bargaining theories of ILMs assume that some employers have high rents and purchase their workers' cooperation with high wages. Moreover, such employers have incentives to maintain rigid wage structures to reduce employee bargaining and influence activities with their supervisors (Milgrom and Roberts 1990; Williamson 1975). In addition, high-wage employers should find it easier to maintain a rigid internal wage structure (Reynolds 1951) in order to insure employees against downturns (Bertrand 1997) or provide

incentives based on long-term contracts (Valletta 1997). In either case, employers with high ability-to-pay are less likely to go out of business soon; thus, their promises are more credible. Because employees give more credence to credible promises, such employers are also more likely to make robust promises and long-term implicit contracts.

Most studies find that increased ability to pay (as measured by past high profits per employee, product-market innovations, or declining costs of inputs) help predict higher wages (e.g., Blanchflower, Oswald and Sanfrey 1996, Carruth and Oswald 1989; but see Groshen 1990). Substantial evidence also suggests that increased product-market competition from increased international trade, deregulation, and other forces have eroded many employers' long-standing product-market rents, which should reduce between-firm wage inequality due to rents.[5] Other studies examine how changes in the environment affect ILM wage features such as internal wage relativities and earning growth (Bertrand 1997).[6]

If product-market rents have declined, then companies are less able to make and keep commitments to employees. Thus, we should see weaker ILMs—in the form of smaller and less persistent employer and internal structure differentials. Moreover, we expect to see these declines particularly in industries subject to deregulation or with rising foreign competition.

Incentives: Many of the descriptive pieces noted above also claim that pay-for-performance has increased. These articles typically mention both individual-based merit pay/bonuses, as well as bonuses based on organizational performance (such as gain- or profitsharing). Increased use of *individual*-level merit pay should raise pay variation among employees with the same job title at a single employer.

By contrast, predictions about the impact of *organizational* incentives on employer and internal structure effects are less clear. Increases in pay tied to the performance of a team or

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[5] Recent conflicts at General Motors are an example. Studies of the phenomenon include how increased trade has affected wage levels in unionized settings (Abowd and Lemieux 1993) or how deregulation affects wage levels in trucking (Belzer 1995), airlines (Card 1996) and telecommunications (see review in Fortin and Lemieux 1997). Most studies find that increased competition lowers the level of wages. However, Lawrence and Lawrence (1985) provide evidence and theory that increased product-market competition need not always reduce bargained wages, particularly if rising in competition alters the bargain to include quasi-rents such those from fixed capital.

[6] Then, if such insurance is imperfect, changes in product markets affect the interaction of wages and local unemployment rates, not just the level of wages. Consistent with the theory, Bertrand finds that wages in industries that face unfavorable exchange rate shocks are both more closely related to current state unemployment rates than are wages in other industries and less closely related to unemployment rates at the time the job began.

subunit within the organization (for example, via gain-sharing for a single division or department) will increase the short-run variability of pay within an organization.

If, as many analysts assert (e.g., see the Annable quote above), firms increasingly link pay to firm-specific performance, the variance of pay among employers should rise. The effect on the persistence of employer wage effects is unclear. If profit shares or bonuses are largely based on improvements over past performance, the persistence of employer pay effects should have declined. The management and prescriptive literatures describes these as payments that do not add to base pay. In other cases, rentsharing for incentive purposes may be built into base wages—leading to persistently high wages for insiders. On the one hand, in a fairly competitive labor market, the higher wage variability between enterprises would not show up at the entry level. In fact, entry-level wages at persistently high-wage firms should be bid down. On the other hand, if fairness or other considerations limit relative wage variability, then this form of profitsharing need not reduce entry-level pay. (When workers are risk-averse, higher pay variability may also raise average pay.) Even when the predicted direction of change is unclear, the stories agree that enhanced incentives should alter many of the patterns we consider here.

Human capital: Our data (like most others) show rising returns to observable human capital. Specifically, the returns to working in an occupation that typically requires more education has risen about as rapidly as the economy-wide rise in the returns to education (Groshen 1991c). It is possible that observed employer or internal structure wage effects largely proxy for employers that hire unusually (unobservably) skilled employees either company-wide or for particular occupations (Abowd et al. 1998). This human capital interpretation of our measures implies that whatever happens to observable human capital should also be reflected in returns to the unobservable skills captured by our employer and internal structure effects. Thus, it predicts rises in the variance of employer and internal wage structures, to match rising variation occupational differentials. Likewise, any temporal patterns in the persistence of occupational differentials should be mirrored in employer and internal structure effect persistence.

Sorting: In a version of human capital theory, Kremer and Maskin (1996) suggest that increased inequality due to technological change raises both the returns to human capital and the sorting of skills between employers. This theory predicts rising variation among employers for the same reasons as the simpler version of human capital theory summarized above. In addition,

this theory predicts that the correlation between being a high-wage employer and being an employer that uses many high-wage occupations should have increased.

Fairness theories, where low-wage employees compare themselves to those in the same firm, can also lead to increased sorting when inequality rises in the market. If many employees perform wage comparisons within the employer, as wage inequalities widen, it becomes increasingly costly to keep high- and low-wage employees in the same company (Cowherd and Levine, 1992). The result can be increased outsourcing and, thus, increased sorting.

3. The Data

We analyze data from 1956 through 1996, gathered in the annual Community Salary Survey (CSS) conducted by the Federal Reserve Bank of Cleveland personnel department. The survey covers employers in Cleveland, Cincinnati, and Pittsburgh, to assist in annual salary budgeting at the Bank.[7] In return for their participation, surveyed companies receive result books for their own use. Salary surveys such as the CSS currently offer the only source of longitudinal wage data accompanied by both detailed occupation and information on employers.[8]

The Bank's personnel department chooses participants in each city to be representative of large employers in the area. Large employers judge which establishments to include in the survey, according to their internal organization. Some include all branches in the metropolitan area, while others report wages for only a single facility. We use the intentionally vague term "employer" to mean the employing firm, establishment, division, or collection of local establishments for which the participant reports wages.[9] The industries included vary widely, although the emphasis is on obtaining employers with many employees in the occupations surveyed. On average about 80 employers are present in any given year.

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[7] See Groshen (1996) for more detail on salary surveys in general and the CSS in particular. In general, Cleveland, Cincinnati, and Pittsburgh are more urban, have more cyclically sensitive employment, and have undergone more industrial restructuring than the nation as a whole. Prior to the 1980s, wages in these three cities were higher than the national average. Now, they are approximately average for the country.

[8] See Hotchkiss (1990) for a summary of data sets with information on employers. For example, the microdata collected in Industry Wage Surveys and Area Wage Surveys by the Bureau of Labor Statistics have occupational detail, but lack any way to identify changes in ownership, are not easily linked over time, and are not preserved for long periods. Unemployment Insurance ES-202 data report average employee earnings by employer, not individual wages, and lack occupational detail. The Longitudinal Research Database, maintained by the Center for Economic Studies, goes back to 1972, but covers only manufacturers and provides only mean establishment earnings for production and nonproduction workers, with no occupational detail.

[9] Since a participant's choice of the entities to include presumably reflects those for which wage and personnel policies are actually administered jointly, the ambiguity here is not particularly troublesome.

The surveyed occupations (see Table 2) are office, maintenance, technical, supervisory, and professional personnel. These are the occupations for which external markets are most developed, since they are needed in all industries. Production jobs, which would be specific to a single industry, are not covered. In many companies, the wage structures determined by job evaluations and other institutions that make up internal labor markets are most important for jobs that do not have a clear reference group in the market. (In fact, job evaluation is often recommended specifically to help set wages when market wages are difficult to observe.) Because our data include only occupations with a clear market, our tests for the importance of ILMs are conservative and understate the true role of ILMs. Many jobs are further divided into a number of grade levels, depending on required responsibilities and experience. Job descriptions for each are at least two paragraphs long.

For the years before 1980, each observation gives the median or mean salary of all employees of a given job title in a given year. After 1980, each observation in the original data set gives the salary of an individual employed in a surveyed occupation by a surveyed employer. Cash bonuses are included as salary, but fringe benefits are not.

The first three columns of Table 3 describe the dimensions of the data set. Variation in the number of employers and occupations is due to occasional missing data, to changes in employer participation over time, and to decisions by the Federal Reserve Bank of Cleveland to change the survey's coverage. The CSS covers between 43 and 100 occupations each year; each employer reports wages for an average of 28 of these. The number of employers per year ranges from 41 to 99. Employer have an average of seven incumbents in each job title (this measure is only available in the 1980s and 1990s).

Employers in the CSS that also list employment in the Compustat database have median employment of 10,250. This figure includes all part-time and seasonal employees, and all employees of both domestic and foreign consolidated subsidiaries. Roughly, a quarter are unionized.

3.1. Comparisons with other data on employees

Since the CSS is not a random sample either of occupations or employers, it is important to place our results in context of the US economy. In particular, the CSS covers common nonproduction occupations in large employers in three Midwestern cities. Table 4 compares

some features of the CSS to the 1995 Current Population Survey (CPS) Outgoing Rotation File. The CPS is the broadest and most-studied household survey. The top panel compares weekly wage statistics in the CSS with those of the CPS and three subsets. The first subset selects the 44 2-digit CPS occupations into which the (more narrow) CSS occupations would fall. The second subset is the states of the East North Central census region (which includes Ohio). The final subset is the most exclusive: CSS occupations in the East North Central region.

As expected, weekly earnings in the CSS sample exceed those of the average US worker. The contrast between overall CPS wage levels and those in CSS occupations suggests that much of this difference is due to the occupations surveyed in the CSS. Restricting the CPS sample to Midwestern states does not noticeably narrow the gap. Remaining differences in wage levels probably reflect urban and employer-size differentials (Brown and Medoff 1989) and the narrower occupational definitions in the CSS.

Wage variation is considerably lower in the CSS. In this case, restricting the CPS samples to CSS occupations does not improve the correspondence. This result is consistent with the CSS pulling less than the full range of narrow occupations within each 2-digit CPS occupational code. In addition, the concentration of large employers in the CSS would also have this effect, because wage variation between large and small firms is omitted.

Nevertheless, the lower panel shows that the occupational relative wage structure of the CSS closely follows that in the CPS. Standard and rank-order correlation coefficients are shown for the whole US and the East North Central. The first three rows show that occupations mean and median wages across the two samples have correlation coefficients of almost .8. The bottom row shows that this correspondence also holds for within-occupation wage dispersion.

Similar comparisons between the CSS and published occupational means in Bureau of Labor Statistics Area Wage Surveys (AWS) for Cleveland, Cincinnati and Pittsburgh for the late 1970s and early 1980s yield correlations in the range of .9 and above. The AWS also oversamples large employers. Movements of mean wages for similar occupations are highly correlated across the two surveys, and levels are usually within 5 percent of each other. CSS respondents appear representative of the broader AWS samples in the three cities.

These comparisons increase our confidence that the findings in the CSS sample are indicative of national conditions for non-production employees of large US firms.

3.2. Comparisons with other data on employers

Table 5 reports on several tests of whether CSS members are representative of similar-sized firms in their industries. In the first year that an employer appears in both the CSS and Compustat, we match it to the Compustat company in the same 2-digit SIC code that is closest in log(sales). We then compare the CSS and matched firms on a variety of accounting measures. We follow the two firms until the end of the sample (1996) or until one of the firms drops out from Compustat—typically due to a merger or acquisition. Our samples for these analyses was reduced to only 52 companies because many employers—such as those that are privately-held or in the nonprofit and public sectors—cannot be matched to Compustat.

Based on a simple t-test, none of the differences between the two samples is statistically significant. For example, the difference in median return on assets in the first year of each match is small: 17.3 percent for CSS versus 16.3 percent for Compustat. Similarly, the two samples both have median debt-to-equity ratios of about 22 percent in the first year of the match. Growth rates of sales and the above ratios are also very similar between the samples.

Survival in the Compustat database mainly measures avoidance of bankruptcy, merger, or acquisition. We cannot measure the mix of reasons that companies drop out of either database. However, a merger or acquisition need not lead to attrition from the CSS if participation continues under the new ownership. This may explain why employers in the CSS sample exit slightly less often than the matched sample (37 percent versus 48 percent, respectively), although the difference is not statistically significant. Median lifetimes in the sample (33 years for CSS, 31 for matches) are similar. A variety of tests for differences in survival times (Wilxocon-Gehan, Mantel-Haenszel, and log-rank, all of which adjust for censoring of still-living companies) cannot reject equal probabilities (Stata 1995: 202).

Thus, the CSS sample looks reasonably representative of Compustat firms of the same industry and size.

3.3. Limitations

Our analysis is subject to several possible limitations. First, the data cover only employers that are invited and willing to participate in this particular salary survey. However, as noted above, government and large employers' share of jobs is large and has remained relatively constant. Moreover, essentially all large employers participate in wage surveys such as the one

we analyze (Lichty 1991; Belcher et al. 1985). In addition, the section above details several tests indicating these employers are reasonably representative of their peers.

Second, all employers in our sample may pay a premium to some or all workers compared to rest of the market. For example, they may pay higher wages to employees with high levels of employer-specific skills. To the extent that our sample acts uniformly, we will find no employer or internal structure effects even when the wage we observe differs from the employees' alternative market wage. In that sense, our measures of the importance of ILMs understate their true role.[10] We have no reason to believe that the bias from this omission has changed over time.

Third, our data do not contain information on noncash compensation. There is some evidence that noncash benefits such as employee stock ownership and stock options are increasingly distributed to non-executives (Lawler 1995). At the same time, most plans distribute relatively little stock to the vast majority of employees (Blasi and Kruse 1991); thus, the bias to our results should be small. Furthermore, Atrostic (1983) and Pierce (1998) find that as individuals' wages rise, more of their total compensation is in nonwage benefits. Thus, the differentials estimated here (particularly inter-firm ones) probably understate total effects.

Finally, we control for, but do not closely examine changes in the composition of employment at the employers we study. It is possible for ILMs to weaken when employers outsource certain functions. This hypothesis remains an active area for extending this research.

4. Method

This section discusses our empirical methodology and some related literature. Our strategy for measuring the importance of ILMs in salary survey data begins with a decomposition of wages. Then we examine time trends in the variation and stability of the components, focusing on the two most associated with the presence of ILMs.

4.1. The decomposition of wages

Because this study relies on salary survey data, it differs in approach from studies that use household surveys. Household data is most naturally directed at identifying the role of human

[10] We thank Rob Valletta for pointing this out.

capital variables in wage determination. Theory tells us that wages are determined by an equation such as:

$$(1) \qquad w_k = \phi H_k + e_k ,$$

where w_k is the log of wages of individual *k*, ϕ is the return to human capital, H_k is the amount of human capital that *k* has, and e_k is an orthogonal, randomly distributed error term. In practice, because household data lack a definitive measure of the multidimensional human capital, we use proxies such as educational attainment and age, and often more ambiguous controls, such as demographic characteristics (e.g., gender, race) or industry. However, these proxies usually capture less than half (often about a third) of wage variation in household data.

Our alternative approach offers insight into the error term in household-survey wage regressions, and particularly into the structure of wages within and between firms. Rather than a household-stratified sample of working individuals, employer wage surveys are a census of individuals working in selected occupations at selected employers. This strategy allows investigation of how changes in employer wage policies affect wage variation. It also allows us to examine wage variations within and between occupations and employers. Both of these characteristics are well identified in employer wage surveys, but not in household data. For a detailed examination of the advantages and limitations of this approach relative to a household survey, see Groshen (1996).

Until 1980, the CSS provides only job-cell mean or median wages. Within this framework, in each year, these wages can be decomposed into the sum of three differentials: an occupation effect plus those due to working at a specific employer, and an employer paying a specific occupation particularly poorly or well (the internal structure differential). The separation is achieved by estimating the following wage equation with a complete set of indicator (dummy) variables for each employer and each occupation:

$$(2) \qquad w_{ij} = \alpha_i O_i + \beta_j E_j + \gamma_{ij} O_i E_j,$$

where w_{ij} = the mean or median log wage of employees in occupation *i* with employer *j* (hereafter called "job cell *ij*"). Coefficients on the dummy variables for occupation and

employer capture the net effects of all wage-relevant differences among occupations and establishments.

The term α_i measures returns to the attributes of employees in occupation *i*. Such attributes include mean human capital, any compensating differentials, and, perhaps, features that give that occupation high bargaining power. Even fairly broad occupational categories, such as those found in the CPS, capture almost all of the variation picked up by education and age, the standard measures of human capital (Groshen 1991b). Thus, narrowly-defined occupation can proxy at least as well for human capital as do standard measures, and the estimated coefficient for an occupation reflects the product of the average human capital in the occupation times the return to human capital, such as modeled in equation (1).

The term β_j measures the average wage differential associated with working for employer *j*. A positive coefficient indicates that the employer pays higher-than-average wages, conditional on its mix of occupations. The more that an employer deviates from the market mean, the more likely it is to have some hiring or compensation strategy that differs from its labor market competitors.

The term γ_{ij} represents the internal wage structure effect for occupation *i* paid by employer *j*. A positive γ_{ij} indicates that employer *i* pays occupation *j* a higher differential, compared to the market, than that employer pays its average occupation. A negative differential shows that the firm *i* pays occupation *j* relatively less well than it does its other occupations. Thus, the extent to which ILMs are insulated from the external market can be gauged by the variation in this component. Although we give γ_{ij} the name "internal structure," it is important to remember that we measure it as a cell mean residual after employer and occupation effects have been subtracted off. Analyses below examine whether this term deserves the moniker "structure."

After 1980, the data allow us to estimate a fuller version of equation (2):

$$(3) \qquad w_{ijk} = \alpha_i O_i + \beta_j E_j + \gamma_{ij} O_i E_j + \mu_{ijk},$$

where w_{ijk} = the mean or median log wage of employees *k* in job cell *ij*, and μ_{ijk} measures employee *k*'s deviation from the mean wage in job-cell *ij*, due to such factors as

individual *k*'s skills, merit pay, and the presence of individual incentive schemes offered by the employer. High variation in this residual term suggests diverse skills within a job title (with little sorting among employers) or a strong individual incentive program.

4.2. Variance components of wages

Groshen (1991c) decomposes the trends in the components of wage variation from 1956 through 1991. Here, we update those results in order to motivate and inform our investigation of the evolution of internal labor markets. Since the CSS includes within-cell variation only for 1980-1996, we focus on between-job-cell wage variation for the entire time period. We then examine within-cell variation trends separately for the last decade and a half. From equation (2), we can decompose any year's between-job-cell variance of wages into four components:

$$(4) \qquad V(w) = V(\alpha) + V(\beta) + 2Cov(\alpha, \beta) + V(\gamma).$$

When the composition of jobs is held constant over time, the change in any term in equation (4) will be due to changes in either the returns to attributes or the attributes of occupations and employers over time.

The occupation component—$V(\alpha)$—is expected to rise over the 1980s because the returns to education increased in the CPS over the decade. Groshen (1991c) confirms both the trend and the link to education and training in the CSS.

Previous studies suggest that wage variation by employer—$V(\beta)$—accounts for a large part of the residual variation (Groshen 1991a,b; Abowd et al. 1994). Although much of this variation is correlated with employer characteristics such as industry and employer size, no single theoretical source for these differentials has gained a consensus. Estimated employer coefficients reflect the net impact of all attributes of the employers that affect their average wages.

Other studies decomposing wage variation find mixed results on the relative importance of within- vs. between-employer wage differences in explaining increased wage variation. Davis and Haltiwanger (1991) compare changes in total wage variability measured in the CPS with changes in between-plant wage variability in the Longitudinal Research Datafile. They conclude that total wage dispersion grew faster than between-plant wage dispersion for nonproduction

manufacturing workers between 1963 and 1988. By contrast, the O'Shaughnessey, Levine and Cappelli (1998) study of managers in 1986 and 1992 finds that most of the increased inequality occurred between, not within, enterprises.[11]

The internal structure component measures the distinctiveness of internal pay relationships among firms (γ). Its path is a main focus of this paper because it has not been examined before, except in briefly in Groshen (1991c).

The covariance term (Cov(α, β)) enters because occupations are not equally represented within each employer. In previous estimates, this term has always been positive, meaning that high-wage firms (controlling for occupation) employ a disproportionate share of high-wage occupations. If this term grows while the distribution of jobs is held constant, it is because the firms with high and growing returns to their attributes also have more than their share of occupations with high and/or growing returns to their attributes. Other studies that find increased sorting include Groshen (1991c, with this dataset), Kremer and Maskin (1996); and industry-level sorting in Belman and Levine (1998) from the CPS. In contrast, O'Shaughnessey, Levine and Cappelli (1998) finds no evidence of increased sorting of skills between employers during a much shorter time period (1986-1992).

Because the CSS is not a random sample, entry and exit is not necessarily the result of market forces. Thus, these surveys are best suited to exploring changes in the returns to attributes rather than changes in the distribution of jobs. Accordingly, we purge the data of changes in composition using a "rolling sample" technique. Between any two years, the change in variation is measured only for the subsamples of job cells that are present in both years. These changes are then added to the cumulative sum of previous changes plus the initial variance, to estimate the impact for an unchanged job-cell.[12]

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[11] Both of these studies have weaknesses that may limit their generality. Davis and Haltiwanger (1991) assume that the estimates of wage variation from a survey of households and plants are comparable. The datas studied by O'Shaughnessey, Levine and Cappelli (1998) come from a single compensation consulting firm. By construction, the employers in that data set use a particular compensation strategy. Thus, the results may not generalize to employers not working under that particular compensation strategy.

[12] The alternative method of controlling for compositional changes is to study only the job-cells that remain in the sample for the whole 42 years. However, this latter approach retains very few observations in long-lived data such as the CSS, while the preferable rolling-sample technique minimizes the number of observations eliminated.

4.3. Autocorrelations of wage components

The central contribution of this paper is an examination of trends in the persistence of wage components over the 40 years of the CSS, since ILMs are, by definition, intended to be stable. Our measure of persistence is the autocorrelation of the three wage components estimated in equation (2): occupation effects (corr(α_{it}, α_{it-})), employer effects (corr(β_{jt}, β_{jt-})), and internal structures (corr(γ_{ijt}, γ_{ijt-})).

Occupation autocorrelations are expected to be high, since they represent the continuity in returns to training or experience and compensating differentials that are held in common across firms.

Although past research leaves us unclear as what determines the size of between-employer wage differences, there is a consensus that these differentials are remarkably persistent. Five- or six-year autocorrelations of employer differentials remain at or above .9 in a variety of data sets (Levine 1992; Groshen 1989; Abowd et al. 1994; and Leonard 1989).

The internal structure component measures the distinctiveness of internal pay relationships among firms (γ). As far as we know, this is the first study of the autocorrelation of the employer-specific internal structure (corr(γ_{ijt}, γ_{ijt-})). This autocorrelation measures whether employers who pay an occupation or set of occupations well in one year, continues to pay them well in subsequent years.

The autocorrelations we calculate are probably biased down due to measurement error in the internal structure effects estimated in our data. Because we do not have longitudinal data on employees, we cannot adjust for measurement error. Instead, we replicate some of the longer-term autocorrelations using centered moving averages to ameliorate these forms of measurement error. There may also be measurement error because we have a sample of occupations, not all of those in an employer. In either case, although measurement error might bias down all of the autocorrelations, there is no reason to expect this bias to have changed much over time.

4.4. Product market shocks, occupational groupings, and robustness checks

After studying the autocorrelations, we extend our results in three distinct directions. The methods and data used for these last exercises are described with the results in the following section.

First, we analyze how two product-market shocks (deregulation and increased foreign competition) affect the level of employer wage effects, the standard deviation of the internal wage structures, and the persistence of employer and internal wage structure effects. Second, we decompose internal structure and occupation effects into pay differences between broad occupational groups (manager and professional versus blue collar versus clerical), within a job ladder (for example, senior versus junior librarians) and between job ladders (librarians versus secretaries). Third, we perform some tests on the robustness of our results.

5. Results

We first show the pattern of increasing wage variance and its components. Then we present findings on the autocorrelations of occupation, employer and internal structure wage components.

5.1. Trends in total variation

The fourth column of table 3 (updating results from Groshen 1991c) shows that wage variation increased substantially over time in these three cities, from a standard deviation of about .31 log points in the 1950s to about .45 log points in the 1990s.[13] Since these standard deviations are taken over the medians (or means) of job cells, with a weight of one per cell, they control for the effect of changes in the number of workers among jobs.

The increased dispersion in the fourth column could simply reflect the possibility that the CSS now includes more diverse occupations and employers than previously. The last column of table 3 presents results that use "rolling samples" (described above) to control for sample changes. The numbers shown are three-year moving averages, to smooth the noise from occasional small samples and interpolate missing years.

Wage variation between job-cells rose substantially in the sample in each of the three decades covered. In particular, wages within and between existing firms and occupations have become markedly less equal since the 1970s. Wage dispersion in the CSS has not risen simply because of the net entry of a disproportionate number of low-wage and high-wage employers or

[13] The discussion in the text focuses on economically large and small changes. All references to changes being "substantial" imply that a t-test of a time trend or of decade dummies supports the reported change as being statistically significant at the 5 percent level. Results of the statistical tests are available upon request.

occupations into the labor market over the period (for a similar finding in household data, see Cameron and Tracy, 1998). The internal and external structure of wages became more unequal.

5.2. Trends in variance components

First we look at the contribution of occupation, employer and internal structure differentials to widening inequality. Then we examine the role of occupation-employer covariance and individual wage variation.

5.2.1. Components of inequality between firms, occupations, and job cells

Figure 1 shows how the three between-cell components of wage dispersion contributed to widening wage dispersion in the CSS from 1956 through 1996. The main reason for the recent widening wage inequality in these large firms is widening occupation differentials. The standard deviation of occupational premiums rose from 27 percent in 1970 to 40 percent in 1996. In a relative sense, the two employer-based sources of wage variation have become relatively less important. However, they have not declined in size over the last 25 years.

Employer differentials are large, as in Groshen (1991c). Wage differentials among CSS employers widened dramatically in the late 1970s; the standard deviation of the employer effects rose from 9 percent in 1970 to 15 percent in 1980. In contrast, these differentials showed little change in the 1960s, 1980s, and 1990s.

The standard deviation of internal structure differentials increased from 11 percent to 15 percent during the 1960s and the 1970s. However, this form of wage variation held steady during the 1980s or 1990s.

5.2.2. Occupation-employer covariance

Figure 3 shows the contribution of employer sorting by occupation to wage variance over time. The covariance is positive, but small. A positive value means that the premiums paid by high-wage employers tends to be received by workers in disproportionately high-wage occupations, adding to overall wage variation. However, this effect is considerably smaller than the other component of wage variation—usually accounting for two to four percent of total variation. From 1978 until 1983, the covariance has a pronounced upward trend, that dissipates somewhat in the 1980s and re-established itself in the 1990s. By 1996, the covariance accounts for over nine percent of total variation. Thus, the CSS provides some evidence in support of

increased wage dispersion being due to increased employer sorting, although the growth starts from a low base.

5.2.3. Variation within employer-occupation job cells

The data allow investigation of wage variation within job-cell only during the 1980s and 1990s. In 1989 a supplemental question was added to the CSS concerning changes in pay for performance. About four-fifths of the employers in this sample report that they implemented or strengthened their merit raise and pay-for-performance programs over the decade. Thus, if these schemes affect the variance of wages, we should see an increase in variation due to this component in the 1980s or 1990s.

Table 6 shows a decomposition of wage variation into the portions between and within job cells from 1980 to 1996. In each year, the standard deviation of wages within job-cell is low, as found in BLS Industry and Area Wage Surveys (Groshen 1991b, 1989). There is only a slight upward trend in within-cell variation—from near eight percent in the early 1980s to near nine percent by the mid- 1990s.[14]. A study of the Hay Associates salary survey also finds only a mild increase in wage variation among employees within job cell (O'Shaughnessey, Levine, and Cappelli 1998).

This result suggests that adoption of individual (as opposed to group-based) pay-for-performance or incentive schemes has widened wage inequality only slightly in the CSS. If such schemes are now a substantially larger source of wage variation than before, they must have largely replaced the variation from other wage-setting practices (such as seniority). Similarly, if such schemes were applied to groups rather than individuals, then they must have replaced a previous source of variation, since neither employer nor internal structure components increased variation in the 1980s.

5.3. Persistence of wage components

ILMs are, by definition, intended to be stable. As Table 1 shows, most hypotheses about changes in ILMs predict changes in the persistence as well as the size of employer-set wage differences. How stable are they in general? We begin by examining the overall persistence of occupational, employer, and internal structure differentials.

Figure 3 compares the stability of these three types of differentials over spans of one to fifteen years. The vertical axis measures the correlation of estimated differentials in one year with estimates from another year. The horizontal axis indicates the number of years spanned. All possible spans in the data are combined to construct the correlations. For example, the one-year employer correlations are calculated over coefficients from every two consecutive years from each respondent firm.

Overall, estimated CSS occupational differentials have a correlation of .99 with the same occupation after one year, declining to .90 when measured 15 years apart. The long-run persistence reflects a strong consistency in the relative evaluation of the skills and working conditions characteristic of occupations. Although employer differentials show less stability than occupational premia (starting at 0.93 and declining to 0.62 over 15 years), nevertheless they suggest a high degree of permanence in employers' wage strategies—as would be expected under an internal labor market, and has been found in other studies. The fifteen-year correlations suggest that workers can expect that, if they join a high-wage firm, it will still be a high-wage firm when they are nearing retirement.

Internal structure differential autocorrelations start at 0.76 one year apart and decline to 0.24 over fifteen years. Since compositional effects (as workers are promoted into and out of the cell) can exert strong influence on cell means and medians, these differentials are expected to be less stable than employer and occupation differentials. (That is, each job-cell has far fewer observations than does an entire firm or occupation, making it more sensitive to moves of a small number of individuals.) Nevertheless, they are strongly positive, indicating fairly stable divergences from market means, particularly over one- to five-year spans. That is, employers with lower relative wages for secretaries than for other employees in one year will probably have low relative wages for many years to come.

5.4. Trends in autocorrelations

Have the autocorrelations that are indicative of the operation of ILMs become less or more stable over the last two decades? To answer this, we graph the autocorrelations plotted in

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[14] Regressing the standard deviation of wages within job-cell against time yields a coefficient of 0.00062 per year (SE = .00024, $P < .05$).

figure 3 separately depending on the end year of the span. If employer and internal labor market differentials have become less stable, we should see a downward drift in autocorrelations.

Figure 4 shows one-, five-, and ten-year autocorrelations for occupational wage differentials arranged by the end-year of the span. Discontinuities in the lines reflect missing data for the end year. Autocorrelations over one- and five-year periods were very high in late 1960s (.99), then fell in late 70s to .94. We then see a slow recovery through 1982-83 recession to .96-.98 and continued growth, back to very high levels near .98. Ten-year autocorrelations fell from late 1960s to a minimum near 1979, and have risen steadily since. Their quick recovery implies that some of the late 1970s drop was transitory changes from persistent differentials (that is, differentials returned to long-term patterns). If occupational wage relativities were becoming less stable (because occupational wages now less protected from shocks, or shocks were larger), these autocorrelations would drift down over the 1980s and 1990s. Although there is some evidence of reordering during the late 1970s (as would be expected during high inflation if wages are rigid—see Groshen and Schweitzer 1996), there is no evidence of a similar decline in stability recently.[15] In fact, ten-year autocorrelations have been rising recently at a statistically significant pace.[16]

Figure 5 repeats the exercise for employer differential autocorrelations. The very early years show evidence of strengthening of internal labor markets, as described in "golden age" descriptions of industrial relations. Again, the 1970s saw some restructuring of employer wage relativities, with recovery of stability in the 1980s and 1990s. One-year autocorrelations are remarkably constant. They drift upward slightly, which is certainly not what we would expect if internal labor markets were becoming less important or undergoing a major reordering.[17] Similarly, the longer-span autocorrelations drift upward slightly (again, statistically significantly)—reinforcing the conclusion that employer wage differences remain as stable now (if not more so) as they were during the 1960s.

Figure 6 plots trends in internal structure persistence. Focusing on the one-year autocorrelations, again there is no evidence of a recent decline in the persistence of wage

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[15] Alternatively, this instability may reflect a data issue. Only job-cell means, not medians are available for the 1970s. Sample means are more sensitive to outliers, so their presence may explain the apparent reduced stability for these years.

[16] $P < .05$ in a quadratic of time for the entire series, or for a linear term in time for a sample restricted to the 1980s and 1990s.

structures. The persistence is hump-shaped with slow decline since the late-1960s peak. (Fitting a quadratic in time to the series of autocorrelations is not statistically significant; thus, neither the hump nor the slow decline is statistically significant.) This peak is almost precisely when Doeringer and Piore performed the field research that led to their 1971 book, and again consistent with the "golden age." Thus, it is not surprising that they stress the rigidity of within-company wage structures. The mid-1970s saw a loosening of these rigidities. However, over the last fifteen years, the one-year autocorrelations have been constant and five-year autocorrelations have trended up.[18]

This pattern means that the extent to which internal wage relationships mirrored the wage ratios among occupations in the external market fell during the 1960s and 1970s, generally preceding the increase in wage variation among employers. Thus, this component does not appear to have grown—as might be expected if the growth of wage differentials for some employers increased their insulation from market pressures and allowed them to deviate more from external market pay ratios. Instead, growth in this component may reflect either varying lags in adjustment to external changes, an increase in uncertainty about market pay ratios, or greater insulation from the market due to a change in worker preferences.

Finally, we note that the variance and persistence behavior of employer and internal structure differentials differ from each other and from that for occupation differentials, calling into question any assumption that they measure returns to the same attributes in the labor market.

5.5. Correlations between changes in ILMs and changes in product markets

In this section we examine how two shocks to product-market rents—deregulation and increases in foreign trade—affect the level, structure, and rigidity of wages. Coupled with the hypothesis that high ability to pay predicts high wage levels, this hypothesis implies that employers with product-market rents are more easily able to pay high wage levels, maintain wage structures that differ from the market, and keep rigid relative wages over time.

We test this set of hypotheses by performing a difference-in-difference quasi-experiment. Specifically, we test whether companies weaken their ILMs when they are in industries that undergo deregulation or face rising import penetration. To control for secular trends that affect

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[17] $P < .05$ on the coefficient of time versus these autocorrelations.

[18] The upward trend since 1980s is statistically significant at the 6% level.

all employers, these comparisons are made in reference to companies that were never regulated or that were always regulated (in the regulation segment) or that have constant regulation. (In this sample, the always-regulated category includes completely public-sector employers.) Our time-series cross-section results also correct for first-order serial correlation for each employer.[19]

5.5.1. Effects of deregulation

We measure the effects of deregulation on four wage aspects of ILMs: the level and persistence of employer wage effects, and the standard deviation and autocorrelation of internal wage structures. Our measures of deregulation derive from the list of industries in Fortin and Lemieux (1997, p. 82).

Wage level impacts (for the eighteen employers we can track) are most simply estimated by comparing mean estimated employer effects for the three to five years prior to deregulation with those after deregulation. In some industries, the process of deregulation involved several regulatory or legislative changes. In such cases, we compare from three to five years prior to the first deregulatory change in the law to three to five years after the final deregulatory change listed by Fortin and Lemieux. This comparison is a difference-in-difference estimate because employer effects are estimated relative to the rest of the sample. Three to five years before deregulation, these companies were low-wage employers, paying 3.9 percent less than the mean. Three to five years after deregulation, the mean employer effect had increased to +2.3 percent, for a statistically significant rise of 6.1 percent. Moreover, outliers do not drive the change in the mean; sixteen of eighteen employer wage effects rise relative to the CSS mean.

Our results contrast with a body of research on the wage effects of regulation that largely finds that product-market regulations raise wages. Possible reasons for the divergence include (1) our sample of employers undergoing deregulation includes many financial firms, whose nonunion employees may have extracted few rents under regulation; or (2) sampling error manifest because we have a small number of employers in the industries that underwent deregulation and only five industry-level deregulation events.

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[19] The measurement of the effects of industry deregulation on wage levels has no comparative advantage over similar regressions performed on the industry level (e.g., Fortin and Lemieux 1997, and the citations there). Thus, the main contribution of this section is the results on the employer wage structures and the persistence of employer wage effects.

We also detect little impact of deregulation on other measures of ILMs (see the right three columns of Table 7). Employers have slightly higher standard deviations of internal wage structures after deregulation. Moreover, never-regulated employers have the same standard deviation as always-regulated employers. Thus, there is no evidence that regulation, per se, permits internal wage structures to deviate from the market. Finally, there is no statistically significant effect of regulation or deregulation on the persistence of employer or internal wage structures.

5.5.2. Effects of rising import penetration

Similar to the results on deregulation, we find no evidence of expected effects of trade penetration on wage levels, structures, or rigidity (see lower panel of Table 7). Our measure of import penetration is drawn from the NBER trade database (Feenstra 1997). We use the industry imports/shipments ratio to calculate our measure of trade. Because changes in trade may take a long time to affect wage levels and structures, we analyze ten-year changes in three-year averages of this ratio. Our dependent variables are decade-long changes in three-year averages of wage structure components, grouped into non-overlapping decades. The results we present examine changes from 1968-70 minus 1958-60, 1978-80 minus 1968-70, and 1988-90 minus 1987-80, and 1994-96 minus 1984-86.[20] In the analyses other than those on employer wage effects, we include industries with no trade data; in those cases, we code import penetration as zero in all years. In each case, the trade penetration measures have no economically or statistically significant effect on our measures of ILM strength and persistence.

Two aspects of this exercise may bias results against finding a trade effect. First, as with the previous test, the effect of imports can be estimated for only a subset of CSS employers. In most decades, only about 32 firms in sixteen industries have positive import penetration. Second, if consistently rigid ILMs pay wages far above the market, industries with such employers will be more likely to attract imports (Bertrand 1997). Thus, our results may understate the correlation between rising imports and declining ILMs.

[20] As a robustness check, we reran the analyses with the data centered on 1955, 1965, 1975, 1985 and 1995. Results were similar.

Nevertheless, conditional on the small samples, the deregulation and trade regressions do not suggest that product-market shocks lead firms to reduce idiosyncratic employer or internal wage effects and start paying wages more similar to the market.

5.6. Separating broad occupational groups and job ladders

In this section we extend the previous results by decomposing the internal wage structure into three portions: between broad occupational groups, within job ladders (i.e., narrowly-defined occupational progressions), and a remainder. The descriptive and prescriptive literatures on ILMs note that wage structures at many employers are constructed separately for different broad occupational groups. Typically, an employer will perform a job evaluation separately for groups, such as blue-collar workers, clerical workers, and managers and professionals (Levine 1991). Thus, we start by decomposing occupational and internal structure differentials we measure into wage differences between these three broad occupational groups, and wage differences within each broad occupational group.

Wage inequality within broad occupational groups can be further decomposed into wage differences between junior and senior workers within a job ladder (e.g., between junior and senior secretaries) and wage inequality between job ladders within the broad occupational groups (e.g., between secretaries and file clerks). It is important to examine the wages between job ladders because some proportion of the variance between occupation may largely be the familiar rising returns to skill and experience observed in other datasets. The data contain seventeen distinct job ladders with more than one title.

5.6.1. Decomposing occupational differentials

Figure 7 shows that the variance of the occupational wage effects rose slowly but steadily from the early 1960s on, with a bump up in the late 1980s. Inequality rose within job ladders from 1973 or so on, corresponding to the widely observed rise in returns to experience and education. The median pay gap between steps of a job ladder rose from 11 percent in 1973 to 18 percent in 1995. (This analysis examines only occupations that appear in both years. Results are similar examining all occupations that are part of a job ladder each year.)

Inequality also rose between broad occupational groups, particularly from the mid-1970s to the late 1980s.[21] This increase in variance was driven by a rise in the mean gap between pink-collar and other occupations. The gap between pink-collar occupations and white-collar occupations rose from .52 log points in 1975 to .66 in 1988. The gap between blue and white-collar occupations has remained almost constant around .31 log points (Table 8). Unexpectedly, essentially none of the increase occurred between job ladders within broad occupational groups. This result again contradicts the hypothesis that most wage changes have been driven by the increasing value of a single dimension of "skill" in the market.

On average, as expected, five-year autocorrelations between broad occupational groups are higher (essentially unity most years) than those within occupational groups (Figure 8). This result reflects both intentional employer policy, and the law of large numbers operating to bring observations of the larger-scale averages close to company intentions. Autocorrelations between ladders within broad occupational groups are also quite high, averaging around .99 in the 1960s and .98 in the 1980s and 1990s. These autocorrelations dipped down to between .88 and .94 in the mid-1970s. The decline in persistence during the 1970s also affected within-ladder differentials—consistent with the widespread adjustments of relative occupational wages associated with high inflation ("grease," in Groshen and Schweitzer 1996).

5.6.2. Decomposing internal structure differentials

As noted above, the variance of the internal wage structures rose slowly but fairly steadily over this period. Figure 9 breaks this rise into the three components outlined above. The sources of the increase varied over time. In the 1960s most of the rise was between job ladders within broad occupational groups. In the mid-1970s there was a modest rise between broad occupational groups. In the early 1980s there was a large increase within ladders. None of these changes has an obvious explanation.

Textbook prescriptions of company wage policies suggest that job evaluation will lead to strong rigidities within broad occupational groups, but will permit some flexibility between them (Levine 1993). Thus, internal structures will be more rigid within broad occupational groups than between them. Working in the other direction, between-occupation groupings average out

[21] In popular usage, "pink-collar jobs" are low-level secretarial, clerical and office white-collar occupations normally held by women. Since we could find no official categorization scheme, the authors and research assistant

measurement error, transitory fluctuations, and the effects of within-cell variation, such as unusual individual pay differences. Empirically, we see that in the 1960s all three five-year autocorrelations are similar, while since 1980 or so the between-collar persistence is higher than that within collars. Finally, the autocorrelations all peak in the late 1960s and fall (especially within ladders) in the mid-1970s (Figure 10). This may reflect the institutional factors that led to pay compression within ladders. Many management press reports of this period reflected the effect of money illusion so that, budgets for nominal salary increases lagged inflation. Many employers needed to keep entry-level wages at market levels; given a fixed wage bill, real wages for senior employees declined.

5.7. Tests for robustness

5.7.1. Tests for CSS effects on wage structures

It is possible that information from the CSS could be a key component in employers' maintenance of rigid ILMs. If so, respondents who do not maintain ILMs will not join the CSS, while those who decide to weaken their internal labor markets will eventually drop out of the CSS. In either case, employers outside the CSS would have very different wage structures than those inside the survey. Our investigations reveal little evidence of such differences.

First, evidence was presented above that the occupational wage structure (in means and standard deviations) in the CSS matches US patterns (as measured by the CPS and AWS) reasonably well. In addition, comparisons with matched Compustat firms are similarly reassuring. Moreover, few participants report that they use the CSS as their main source of wage-setting information.[22]

Second, to explore further this possibility, we take advantage of the entry and exit of firms from the sample. We isolate the behavior of firms in the years immediately after they join the CSS and before they leave it. If participants in the CSS are markedly different from the rest of the market, then new entrants will have differing wage structures that may converge to the rest of the CSS as participation continues. In addition, respondents that are about to drop out may show signs of divergence or reordering in the years preceding their departure from the sample.

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relied on our own knowledge of the nature of CSS occupations to distinguish between pink- and white-collar jobs.

[22] This question was asked in a supplemental survey in 1989.

One-year employer autocorrelations for entrants in their first year are negligibly lower than for the whole CSS population sample (0.92, compared to 0.93), while those about to exit show no difference at all. In wage level, new entrants pay an average of 4% below the sample mean in their first year. Those about to exit pay about 2% above the CSS mean in the last year before they leave the sample. Both of these wage-level differences dissipate in the years further from entry or exit.

Internal structure wage differentials are again slightly less persistent for newcomers' first years (0.72) as compared to the rest of the sample (0.76). This result is consistent with some reordering--but not major realignment, since the difference is small and occurs only in the first year.[23] Companies that are about to exit the sample do not have noticeably different autocorrelations from stayers.

These probes suggest that it is unlikely that CSS respondents are extremely different from the rest of the market. Nevertheless, some of the results are consistent with a mild conforming influence of participation in the CSS. And some changes could take place in the years before entry or after exit. However, the 2% wage premium associated with immanent exit is inconsistent with a characterization of leavers as those who are reverting to a low-wage, spot-market employment strategy.

5.7.2. Reducing measurement error

We perform two tests for biases that may be introduced by measurement error. Neither indicates that measurement error is likely to drive the autocorrelation patterns above.

First, as noted above, measurement error can bias down the autocorrelations we observe. For example, most employers pay a job title a salary range, not a single figure for all job incumbents. If an employee receives a promotion from the top of one range to the bottom of the next highest range, both means can decline. At the same time, the *structure* of salary midpoints and ranges is unchanged. To ameliorate measurement error of long-term autocorrelations, we calculate autocorrelations of three-year centered moving averages (Solon 1992). That is, instead of correlating the 1970 and the 1980 internal wage structures, we correlate 1969-1971 average internal structures with their 1979-1981 counterparts. We find that autocorrelations of such

[23] Indeed, it could just as easily signal a learning process in identifying occupations for the survey.

moving averages are smoother over time, but otherwise very similar in their level and in their change over time to those calculated without averaging.

Second, to ensure that our results are not due to the presence or absence of a few outliers, we reran the main analyses using rank autocorrelations instead of standard autocorrelations. Again, results were very similar.

6. Conclusion

Before we discuss the results, it is important to recall their context. Our data include a limited and select group of employers—all large, old, and in the Midwest. These factors plausibly increase the role of ILMs. Our data covers "staff" occupations, not frontline employees who do production work (assembly line workers, waiters, or bank tellers) or their direct supervisors.[24] We measure cash compensation, and thus may miss changes in elements of compensation that are either large (e.g., benefits) or growing in importance (e.g., stock options for mid-level managers).

With these cautions in mind, the main results summarized by decade include:

1. The 1960s saw a strengthening of internal labor markets, as measured by the size and persistence of employer and internal structure wage differentials.

2. During the early 1970s, the rigidity of internal structure differentials peaked. Then they gradually became more flexible. Employer differentials were reordered and magnified in the late 1970s.

3. Occupational wage differentials were magnified during the 1980s and early 1990s, but were no less persistent. Employer and internal structure differentials maintained their size and persistence. Within-job-cell wage dispersion remained small throughout this period, but increased slightly.

The interpretation of these facts vis-à-vis general theories of wage determination is less than clear, because numerous theories purport to explain why wages differ between and within employers. However, these results do support and lean against certain variants of the theories of current labor market changes reviewed in Table 1.

"Internal labor markets once prevailed, and have since declined." Consistent with the hypothesized "golden age" of ILMs during the 1960s, we find large and persistent wage differences between employers and subsets of occupations at each employer. Their persistence declined during the mid-1970s. However, contrary to the hypothesis of ILMs dissolving into a spot market, we do not find declining size or persistence of employer or internal structure differentials during the last fifteen years.

It is puzzling that press reports of the decline of ILMs are so much more dramatic than researchers' measurements of changing job stability and wage rigidity. Perhaps some self-selection into the CSS sample retains the minority of workplaces that use ILMs. Alternatively, the trends described in the press may be gathering steam now. In a few years, updates of this analysis could show much more dramatic changes. Our long time period also lends perspective on relatively minor changes since 1980, which is the starting point of many other analyses—such as those examining the Displaced Worker Survey. Finally, press reports may emphasize the experience of certain demographic subgroups such as middle-aged men, rather than the whole labor market.

"Ability to pay is less important as product rents and bargaining power have declined." We find no support for the reduction in the size and persistence of wage differentials between employers and of internal structures that this hypothesis predicts. When we examine the effects product market conditions (using a small sample of employers) we again find little evidence that employers in product markets more affected by shocks had larger changes in ILMs.

"Incentive pay is increasingly important." We find slight increases in pay dispersion within a job title at an employer, consistent with modest increases in individual-level incentives. However, we do not observe higher short-lived variance between jobs, as team-level or division-level gain-sharing would induce. We find no increase in the variance of employer wage effects, as theories of increased company-wide incentives would suggest. (Our measures do not include some potentially important forms of company-wide profit-sharing, such as deferred plans.)

"Rising returns to human capital drive higher variation in all dimensions of pay inequality." Inequality among occupations rose during the 1980s and 1990s. As theories of

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[24] At the same time, our dataset contains "benchmark" jobs; those most likely to be found at many employers. These jobs are likely to be the ones tied most closely to the market, understating the importance of ILMs on the labor market in general.

human capital suggest, these rises are highly correlated with the average education needed to fill each job (Groshen, 1991c). At the same time, other pay differentials did not increase at all, or did not increase rapidly. Variation in the pace of changes casts doubt on the simple hypothesis that all increased wage variation is due to enhanced returns to human capital. In that case, the higher returns to skills captured by occupations should also lead to higher returns to the skills within occupations and between employers.[25]

"Sorting has increased." The correlation between the average wage of the occupations employed at a firm and the firm's average pay rose meaningfully, but from a very low base. This rise supports certain theories of human capital (e.g., Kremer and Maskin, 1995), and certain theories of social comparison as a reason for rising outsourcing. An important avenue for further research involves testing for whether outsourcing is a substantial force in weakening ILMs. We will investigate whether large employers, particularly those with high average skills and wages, are eliminating low-skill occupations.

Future research: Economic theorists are beginning to grapple with ILMs just as the management press proclaims their demise. Our results, taken in concert with findings of minimal changes in job stability, suggest that the announced death of ILMs may be premature. Nevertheless, both careers and ILMs are evolving, even if not in the dramatic way that some observers suggest. Our findings suggest that future research will need novel data sets and perhaps new theory to explain this evolution. We expect that researchers will continue to examine job stability and tenure. At the same time, compensation patterns and rigidities can affect employment stability; moreover, compensation is an outcome that employees and policy-makers care about directly. Whatever the explanation, to understand the evolution of ILMs and careers, the price (wage) side of the equation is as important as the much-studied quantity (tenure) side.

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[25] These results test only one variant of human capital theory. It is easy to construct other variants with many forms of unmeasured skills, some of which are correlated with occupation, others with employer, and yet others with rank in the wage distribution within a job title. If only some of these forms of unmeasured skill experienced rising returns in the 1980s and 1990s, wage differentials will follow different paths over time.
Nevertheless, we stress that our results are inconsistent with mainstream interpretations that use human capital theory as a unifying framework for understanding rising inequality. Several widely cited papers have used rising returns to race (Juhn, Murphy and Pierce 1993) and to plant size in manufacturing (Haltiwanger and Davis 1991) as evidence that these differentials represent unmeasured skills whose returns is rising along with returns to measured human capital. If human capital theory can "explain" any increases in arbitrary wage differentials that occur when returns to measured skill rise, it should also be able "explain" the wage differentials that remain constant or barely rise (as we find) or that decline (e.g., the gender differential—see Blau and Kahn, 1997).

References

Abowd, John A., Francis Kramarz and David Margolis, "High Wage Workers and High Wage Firms," *Econometrica*, (1998, forthcoming).

Abowd, John A. and Thomas Lemieux, "The Effects of Product Market Competition on Collective Bargaining Agreements: The Case of Foreign Competition in Canada," *Quarterly Journal of Economics*, CVIII (1993), 983-1014.

Akerlof, George, "Gift Exchange and Efficiency Wage Theory," *American Economic Review*, LXXIV (1984), 79-83.

Annable, James, "Insecure Executives Make the Economy Grow," *The Wall Street Journal*, April 28, 1997.

Atrostic, B.K., "Alternative Pay Measures and Labor Market Differentials." Working Paper No. 127, U.S. Department of Labor Office of Research and Evaluation, Bureau of Labor Statistics, March 1983.

Baker, George and Bengt Holmstrom, "Too Many Theories, Too Few Facts," *American Economic Review*, LXXXV (1995), 255-259.

Baker, George, Michael Gibbs and Bengt Holmstrom, "The Wage Policy of a Firm," *Quarterly Journal of Economics*, CIX (1994), 921-55.

Baily, Martin Neil, "Wages and Employment Under Uncertain Demand," *Review of Economic Studies*, XLI (1974) 37-50.

Becker, Gary, *Human Capital*, 2nd edition, (Chicago, IL: University of Chicago Press, 1975).

Becker, Gary and George Stigler, "Law Enforcement, Malfeasance, and the Compensation of Enforcers," *Journal of Legal Studies*, III (1974), 1-13.

Belcher, D. W., N. Bruce Ferris and John O'Neill, "How Wage Surveys Are Being Used," *Compensation & Benefits Review*, XVII (Sep./Oct. 1985), 34-51.

Belman, Dale and David I. Levine, "Have Internal Labor Market Wage Structures Declined in Large Employers?" U.C. Berkeley mimeo, 1998.

Belzer, Michael H., "Collective Bargaining After Deregulation: Do the Teamsters Still Count?" *Industrial & Labor Relations Review*, XLVIII (1995), 636-655.

Bertrand, Marianne, "From the Invisible Handshake to the Invisible Hand? How Product Market Competition Changes the Employment Relation," Harvard University mimeo, 1997.

Blanchflower, David G, Andrew J. Oswald and Peter Sanfey, "Wages, Profits, and Rent-Sharing," *Quarterly Journal of Economics*, CXI (1996), 227-251.

Blasi, Joseph R. and Douglas L. Kruse, *The New Owners*, (New York: Harper, 1991).

Blau, Francine D. and Lawrence M. Kahn, "Swimming upstream: Trends in the gender wage differential in the 1980s." *Journal of Labor Economics*, XV (1997), 1-42.

Brown, Charles and James L. Medoff, "The Employer Size Wage Effect," *Journal of Political Economy*, XCVII (1989), 1027-59.

Burack, Elmer H. and Robert P. Singh, "The New Employment Relations Compact," *Human Resource Planning*, XVIII (1995), 12-19.

Cameron, Stephen and Joseph Tracy, "Earnings Variability in the United States: An Investigation Using Matched-CPS Data," mimeo, Federal Reserve Bank of New York, April 1998.

Cappelli, Peter, "Rethinking Employment," *British Journal of Industrial Relations*, XXXIII (1995), 563-602.

Card, David, "Deregulation and Labor Earnings in the Airline Industry," NBER Working Paper No. 5687, 1996.

Carruth, Alan and Andrew Oswald, *Pay Determination and Industrial Prosperity*, (Oxford: Clarendon Press, 1989).

Cashman, Kevin and Janet Feldman, "Reengineering the Employment Contract," *Executive Excellence*, XII (1995), 15-16.

Cowherd, Douglas and David I. Levine, 20. "Product Quality and Pay Equity Between Low-Level Employees and Top Management: An Investigation of Distributive Justice Theory," *Administrative Science Quarterly*, XXXVII (1992), 302-320.

Davis, Steve J. and John Haltiwanger, "Wage Dispersion Between and Within US Manufacturing Plants: 1963-86," *Brookings Papers on Economic Activity*, Microeconomics (1991), 115-200.

Diebold, Francis X., David Neumark and Daniel Polsky, "Job Stability in the United States," *Journal of Labor Economics*, XV (1997), 206-233.

Doeringer, Peter B. and Piore, Michael, *Internal Labor Markets and Manpower Analysis*, (Lexington MA: Heath, 1971).

Dunlop, John, "The Task of Contemporary Wage Theory," in *The Theory of Wage Determination*, (London: Macmillan, 1957).

Erickson, Christopher L., "A Re-Interpretation of Pattern Bargaining," *Industrial and Labor Relations Review*, XLIX (1996) 615-634.

Farber, Henry, "The Changing Face of Job loss in the United States, 1981-1993," NBER Working Paper No. 5596, 1996.

Feenstra, Robert, "NBER Trade Database, Disk 1: U.S. Imports, 1972-1994," NBER Working Paper 5515, 1996. [Updated version at http://www.nber.org/~feenstra/, October 1997.]

Fortin, Nicole M. and Thomas Lemieux, "Institutional Change and Wage Inequality," *Journal of Economic Perspectives*, XI (1997), 75-96.

Gottschalk, Peter and Robert Moffitt, "The Growth of Earnings Instability in the U.S. Labor Market," *Brookings Papers on Economic Activity*, 2 (1994), 217-272.

Groshen, Erica L., "Do Wage Differences Among Employers Last?" Federal Reserve Bank of Cleveland Working Paper No. 8906, 1989 [revised 1991].

Groshen, Erica L., "Ability to Pay, Rent Capture, and Salaries in the Private Sector," in *Proceedings of the Fortieth Annual IRRA Meeting*, (Madison, WI: Industrial Relations Research Association, 1990).

Groshen, Erica L., "Five Reasons Why Wages Vary Among Employers," *Industrial Relations*, XXX (1991a), 350-381.

Groshen, Erica L., "Sources of Intra-Industry Wage Dispersion: How Much Do Employers Matter?" *Quarterly Journal of Economics*, CVI (1991b), 869-884.

Groshen, Erica L., "Rising Inequality in a Salary Survey: Another Piece of the Puzzle," Federal Reserve Bank of Cleveland Working Paper No. 9121, 1991c.

Groshen, Erica L., "American Employer Salary Surveys and Labor Economics Research: Issues and Contributions," *Annales d'Economie et de Statistique*, No. 41/42, (1996), 413-442.

Groshen, Erica L. and Mark E. Schweitzer, "The Effects of Inflation on Wage Adjustments in Firm-Level Data: Grease or Sand?" Federal Reserve Bank of New York Staff Report, 1996.

Hotchkiss, Julie, "Compensation Policy and Firm Performance: An Annotated Bibliography of Machine-Readable Data Files," *Industrial and Labor Relations Review*, XLIII (February 1990), 274-89

Jacoby, Sanford M., *Modern Manors: Welfare Capitalism Since the New Deal*, (Princeton, NJ: Princeton University Press, 1997).

Juhn, Chinhui, Kevin M. Murphy and Brooks Pierce. 1993. "Wage Inequality and the Rise in the Returns to Skill." Journal of Political Economy Vol. 101 no.3, pp.410-442.

Kanter, Rosabeth Moss, "From Status to Contribution: Some Organizational Implications of the Changing Basis for Pay," *Personnel*, LXIV (1987), 12-37.

Kiechel, Walter III, "Your New Employment Contract," *Fortune*, CXVI (1987), 109-110.

Kissler, Gary D., "The New Employment Contract," *Human Resource Management*, XXXIII (1994), 335-352.

Kremer, Michael and Eric Maskin, "Wage Inequality and Segregation by Skill," NBER Working Paper 5718 (1995).

Lawler, Edward E., Susan Mohrman and Gerald Ledford, *Creating High-Performance Organizations* , (San Francisco: Jossey-Bass, 1995).

Lawrence, Colin and Robert Z. Lawrence, "Manufacturing Wage Dispersion: An End Game Interpretation," *Brookings Papers on Economic Activity*, 1 (1985), 47-116.

Lazear, Edward and Sherwin Rosen, "Rank-Order Tournaments as Optimum Labor Contracts," *Journal of Political Economy*, LXXXIV (1981), 841-864.

Lazear, Edward, "Agency, Earnings Profiles, Productivity, and Hours Restrictions," *American Economic Review*, LXXI (1981), 606-20.

Lazear, Edward P., "A Jobs-Based Analysis of Labor Markets," *American Economic Review*20 , LXXXV (1995), 260-265.

Leonard, Jonathan, "Wage Structure and Dynamics in the Electronics Industry," *Industrial Relations*, XXVIII (1989), 251-275.

Lester, Richard A., *Company Wage Policies: A Survey of Patterns and Experience*, (Princeton, NJ: Princeton University Press, 1948).

Levine, David I., "Cohesiveness, Productivity, and Wage Dispersion," *Journal of Economic Behavior and Organization*, XV (1991), 237-255.

Levine, David I., "Can Wage Increases Pay for Themselves? Tests with a Production Function," *Economic Journal*, CII (1992), 1102-1115.

Levine, David I., "Fairness, Markets, and Ability to Pay: Evidence From Compensation Executives." *American Economic Review*, LXXXIII (1993), 1241-1259.

Lichty, D. Terence, "Compensation Surveys," in *The Compensation Handbook* by Milton L. Rock and Lance A. Berger, editors, 3rd edition. (New York: McGraw-Hill, 1991).

Livernash, E. Robert, "The Internal Wage Structure," in *New Concepts in Wage Determination* by George Taylor and Frank Pierson, editors, (New York: McGraw-Hill, 1957).

Malcomson, James M., "Contracts, Hold-Up, and Labor Markets," *Journal of Economic Literature*, XXXV (1995), 1916-1957.

Manicatide, Mircea and Virginia Pennell, "Key Developments in Compensation Management," *HR Focus*, LXIX (1992), 3-4.

Milgrom, Paul R. and John Roberts, "Bargaining Costs, Influence Costs, and the Organization of Economic Activity," in *Perspectives on Positive Political Economy* by James-E. Alt and Kenneth A. Shepsle, editors, (New York: Cambridge University Press, 1990).

Neumark, David, *Changes in Long-Term Employment Relations* (working title), (Russell Sage Foundation, 1998 forthcoming).

New York Times, *The Downsizing of America*. (New York: Times Books, 1996).

O'Shaughnessey, K.C., David I. Levine and Peter Cappelli, "Changes in Managerial Pay Structures 1986-1992: Tests of Human Capital and Other Explanations," U.C. Berkeley mimeo, 1998.

Pierce, Brooks, "Compensation Inequality," US Bureau of Labor Statistics mimeo, April 1998.

Reynolds, Lloyd G., *The Structure of Labor Markets*, (New York: Harper and Brothers, 1951).

Ready, K.J., "Is Pattern Bargaining Dead?" *Industrial & Labor Relations Review*, XLIII (1990) 272-279.

Richman, Louis S., "When Will the Layoffs End?" *Fortune*, CXXVIII (1993), 54-56.

Rose, Stephen J., "Broken Promises: The Decline of Employment Stability in the 1980s," *National Commission for Employment Policy Research*, (April 1995).

Salop, Joanne and Steven Salop, "Self-Selection and Turnover in the Labor Market," *Quarterly Journal of Economics*, XC (1976), 619-627.

Shapiro, Carl and Joseph Stiglitz, "Equilibrium Unemployment as a Worker Discipline Device," *American Economic Review*, LXXIV (1984), 433-444.

Solon, Gary, "Intergenerational Income Mobility in the United States," *American Economic Review*, LXXXII (1992), 393-408.

StataCorp, *Reference Manual: Release 4.0*, (College Station, TX: Stata Press, 1995).

Stiles, Philip, Lynda Gratton, Catherine Truss, Veronica Hope-Hailey and Patrick McGovern, "Performance Management and the Psychological Contract," *Human Resource Management Journal*, VII (1997), 57-66.

Valletta, Robert G., "Declining Job Security," Federal Reserve Bank of San Francisco mimeo, 1997.

Williamson, Oliver, *Markets and Hierarchies*, (New York: The Free Press, 1975).

Table 1

Hypotheses About Changes in Internal Labor Markets

Hypothesis	Predicted Effects on Observables in the CSS			
	Employer Wage Effect Variation and Persistence	**Internal Wage Structure Variation and Persistence**	**Within Job-Cell Wage Variation**	**Occupational Wage Effect Variation and Persistence**
Spot market: Less need for firm-specific human capital dissolves ILMs into a spot market	Declining	Declining	Rising	Rising variation, declining persistence
Ability to pay: Less (long-term) rent extraction[a]	Declining	Declining		
Incentives:				
Pay tied more to current individual performance (bonus plans & merit pay)		Declining persistence	Rising	
Pay tied more to team or department performance (team bonuses, gainsharing)		Rising variance		
Pay tied more to firm-specific performance (profitsharing plans)	Rising variance			
Human capital: Most wage differentials reflect measured or unmeasured human capital, whose value is rising	Rising	Rising	Rising	Rising
Sorting: Increased employer sorting by human capital[b]	Rising	Rising		Rising

[a]Also predicts that employer wage effect and strength of ILM measures will decline more in industries subject to deregulation and import competition.
[b]Also predicts that the correlation between being a high-wage employer and being an employer that uses many high-wage occupations should have increased.

Table 2
Occupations in the Cleveland Community Salary Survey (1955 - 1996)

Account Executive	Clerk Typist C	IBM Unit Head	Press Operator I
Accounting Clerk I	Clerk Typist II	Information Processor II	Press Operator II
Accounting Clerk II	Comp & Benefits Admin.	Information Security Analyst II	Programmer I
Accounting Manager	Comp & Benefits Manager	Internal Audit Manager	Programmer II
Accounting Supervisor	Comp Analyst	Inventory Control Clerk	Programmer/Analyst III
Accounts Payable Clerk	Computer Operations Manager	Job Analyst	Proof Clerk
Addressograph Operator	Computer Operns. Supervisor	Junior Auditor	Proof Machine Checker
Administrative Asst I	Computer Operator I	Junior Computer Operator	Proof Machine Operator
Administrative Asst II	Computer Operator II	Junior Economist	Protection Manager
Administrative Asst III	Console Operator	Junior Stenographer	Public Relations Specialist
Administrative Secretary	Contracts Administrator	Lead Carpenter	Purchasing Agent
Analyst Programmer I	Correspondence Clerk	Lead Check Processor	Purchasing Clerk
Analyst Programmer II	Custodian	Lead Computer Operator	Receptionist
Asst. Analyst Programmer	Custodian	Lead Mail Clerk	Receptionist Clerk
Asst. Console Operator	Custodian II	Lead Painter	Records/Files Clerk
Asst. Dept. Manager	Data Entry Operator	Lead Programmer	Registered Nurse
Attorney	Data Processing Manager	Lead Stock Clerk	Research Statistician
Attorney II	Data Processing Supervisor	Librarian	Secretary to Adm. Officer
Audit Analyst I	Dayporter	Mail Clerk	Secretary to CEO
Audit Analyst II	Department PC Specialist	Mail Clerk I	Securities Proc. Clerk
Audit Analyst III	Dept. Manager	Mail Supervisor	Security Guard
Audit Clerk	Dept. Manager	Maintenance Mechanic I	Sen. Proof Machine Operator
Audit Manager	Dept. Manager II	Maintenance Mechanic II	Senior Attorney
Audit Team Manager	Dept. Secretary	Mechanic I	Sergeant of the Guard
Bookkeeping Machine Operator	Dept. Secretary II	Mechanic II	Sr. Audit Clerk
Budget Analyst	Division Head	Messenger	Sr. Budget Clerk
Budget Manager	Duplicating Operator	Methods Analyst I	Sr. Functional Expense Clerk
Building Engineer I	Economic Advisor	Methods Analyst II	Sr. Keypunch Operator
Building Engineer II	Economist	Multilith Operator	Sr. Stenographer
Building Equipment Mechanic	Economist II	Night Cleaner - Male	Sr. Supervisor
Building Manager	Editor	Office Equipment Mechanic I	Sr. Systems Analyst
Camera Operator	Editor House Publications	Office Equipment Mechanic II	Statistical Clerk
Captain of the Porters	EDP Audit Analyst I	Offset Pressman	Statistical Clerk I
Carpenter	EDP Audit Analyst II	Operating Engineer	Stenographer
Charwoman	Electrician	Operating Engineer	Stock Clerk
Charwoman-Night	Employee Benefits Counselor	Operations Research Anlst. I	Supervisor
Check Adjustment Clerk	Employee Benefits Specialist	Operations Research Anlst. II	Systems Analyst
Check Adjustment Clerk II	Employment Interviewer	Org. Development Specialist	Systems Consulting Analyst
Check Processing Clerk I	Employment Supervisor	Painter	Systems Project Manger
Check Processing Clerk II	Executive Secretary	Paymaster	Tabulating Operator
Check Processing Clerk III	File Clerk	Payroll Clerk I	Tape Librarian
Check Processing Supervisor	File Clerk A	Payroll Clerk II	Telephone Operator
Chief Building Engineer	Forms Designer	Payroll Supervisor	Trainee Keypunch Operator
Chief Electrician	General Clerk C	Personal Interviewer	Training Coordinator
Chief Maintenance Mechanic	General Ledger Bookkeeper	Personnel Clerk	Unit Head
Chief Mechanic	Graphics Illustrator	Personnel Interviewer	Washroom Maid
Clerk Typist	Guard Supervisor	Personnel Manager	Word Processor
	Head Telephone Operator	Personnel Receptionist	

Table 3

Characteristics of CSS Data Set, 1956-1996

Year	Total Number of:			Std. Dev.(Log Wage) Among Job-Cells*	
	Job-Cells	Occupations	Employers	Total Sample	Rolling Sample (Smoothed)
1956	1,473	44	77	.314	.304
1957	1,737	47	87	.310	.300
1958	1,737	43	88	.299	.297
1959	1,749	43	88	.296	.297
1960	1,749	43	87	.303	.298
1961	1,993	50	96	.305	.302
1962	1,978	53	94	.311	.304
1963	2,122	53	99	.313	.308
1964	2,250	53	95	.318	.311
1965	2,279	53	97	.323	.315
1966	missing				.317
1967	2,224	53	94	.321	.315
1968	2,383	55	96	.332	.315
1969	2,426	53	97	.333	.316
1970	missing				.319
1971	1,460	66	41	.340	.319
1972	954	66	61	.340	.322
1973	1,048	66	66	.342	.326
1974	1,504	40	80	.331	.333
1975	1,215	42	50	.345	.338
1976	1,466	42	75	.344	.345
1977	2,240	72	73	.411	.352
1978	2,635	92	70	.417	.363
1979	3,048	100	83	.425	.367
1980	3,370	100	90	.412	.370
1981	2,477	68	86	.419	.366
1982	2,316	67	84	.417	.365
1983	2,493	76	84	.422	.365
1984	2,748	76	86	.425	.368
1985	2,736	75	88	.417	.370
1986	2,851	76	91	.435	.373
1987	2,742	76	85	.440	.379
1988	2,668	76	84	.447	.383
1989	2,701	76	83	.446	.388
1990	2,931	75	96	.445	.390
1991	2,711	76	90	.451	.395
1992	2,512	75	89	.456	.400
1993	2,488	75	85	.451	.405
1994	2,500	83	84	.458	.406
1995	1,967	83	66	.457	.403
1996	1,694	83	57	.441	.397
TOTAL	87,575				

*In log wage point units. Weight: one observation per job-cell. Source: Authors' calculations from the CSS.

Table 4

Comparison of Weekly Earnings in the 1995 CSS With the 1995 CPS Outgoing Rotation File

A. Means, Medians and Standard Deviations of Weekly Earnings

	CSS	Current Population Survey			
		Whole Sample	CSS Occupations	East North Central Reg.	CSS Occs. In ENC Region
Mean	646	500	614	511	616
Median	577	403	504	423	520
Log median	6.36	6.00	6.22	6.05	6.25
Std. deviation	280	365	415	369	412
Std. dev. of log	0.413	0.817	0.773	0.839	0.793
Number of observations	14,351	169,781	40,230	27,544	6,316

B. CSS - CPS Correlations of Occupational Wage Structure

	CPS—All US		CPS—East North Central	
	Pearson Correlation	Spearman (Rank Order)	Pearson Correlation	Spearman (Rank Order)
Mean	0.790	0.798	0.785	0.796
Median	0.757	0.783	0.750	0.765
Log Median	0.787	0.783	0.766	0.765
Std. Deviation	0.776	0.779	0.708	0.772

Notes: In the top panel, "CSS occupations" denotes observations in the 44 2-digit CPS occupational codes corresponding to occupations in the CSS. For the correlations, in the CSS data, the 83 occupations were aggregated into 44 occupational groups corresponding to the 2-digit CPS codes. All correlations are statistically significant at above the .1% level.

Source: Authors' calculations from the Federal Reserve Bank of Cleveland Community Salary Survey and the Current Population Survey Outgoing Rotation File, 1995.

Table 5

Comparisons of CSS and Matched Compustat Employers

	Sample Medians		Test for Hypothesis That Median Difference = 0	
	CSS Employers	**Compustat Matches**	**Statistic**	**Value**
Sales (millions of 1966 dollars)	649	632	Not applicable[a]	--
Change in log sales	+4.6	+3.0	t-statistic	1.56
Percent return on assets (ROA)	17.3	16.3	t-statistic	0.64
Change in ROA	-0.14	-0.07	t-statistic	-0.51
Debt/equity (percent)	21.7	22.4	t-statistic	-1.26
Change in debt/equity	+0.4	+0.2	t-statistic	1.36
Percent of sample that survived until sample end (1996)	62	53	Z-statistic[b] P-value	-1.2 0.23

Notes: Levels were measured from the first year the focal firm was in the CSS and in Compustat, which was also the year the matched firms was chosen. Changes were measured to last year that both firms were in Compustat.

[a] Samples were matched on log(sales).

[b] These are the Z-statistic and associated P-value of the Gehan generalization of the Wilcoxon-Mann-Whitney test for differences in survival times in the Compustat database between CSS and matched firms (Stata 1995). This test adjusts for censoring of the data by the end of the sample in 1996.

Table 6

Wage Dispersion Within CSS Job-Cell During the 1980s and 1990s

Year	Number of Observations	Standard Deviation of Log Wages*		
		Total	Between Job Cells	Within Job Cell
1980	23,475	0.353	0.342	0.086
1981	19,753	0.355	0.344	0.088
1982	18,302	0.347	0.339	0.077
1983	19,336	0.352	0.344	0.078
1984	19,379	0.355	0.345	0.082
1985	20,101	0.362	0.353	0.080
1986	20,893	0.378	0.369	0.083
1987	21,552	0.384	0.375	0.081
1988	20,293	0.397	0.388	0.088
1989	21,613	0.384	0.375	0.084
1990	22,327	0.388	0.379	0.086
1991	21,945	0.389	0.378	0.088
1992	8,769	0.368	0.352	0.099
1993	20,870	0.399	0.388	0.092
1994	18,487	0.415	0.405	0.088
1995	14,351	0.413	0.405	0.082
1996	10,932	0.418	0.408	0.093

*In log-wage-point units.

Table 7

The Effect of Product-Market Shocks on Measures of ILMs

A. Deregulation Regression Coefficients

Indicator Variable	Dependent Variable			
	Employer Wage Effect	Standard Deviation of Internal Wage Structure	One-Year Change in Employer Wage Effect	One-Year Autocorrelation of Internal Wage Structure
Pre-deregulation	-.053	-.004	.0003	.017
	(.016)	(.003)	(.002)	(.020)
Near-deregulation	-.0424	.017	.001	-.011
	(.017)	(.005)	(.003)	(.032)
Post-deregulation	-.027	.025	.002	.008
	(.016)	(.004)	(.002)	(.022)
Always-regulated	*	.006	-.001	.039
		(.004)	(.002)	(.020)
Never-regulated	.006	.131	.033	.747
	(.013)	(.002)	(.001)	(.008)
Number of observations	1,405	3,100	2,709	2,580

*Regression did not include always-regulated dummy.
Standard errors are in parentheses.

B. Foreign Competition Regression Coefficients

Independent Variable	Dependent Variable—Intra-decade Change[a] in:			
	Employer Wage Effect	Standard Deviation of Internal Wage Structure	One-year Change in Employer Wage Effect	One-year Autocorrelation of Internal Wage Structure
Intra-decade change in industry import penetration ratio[b]	.702	.050	-.027	.644
	(.586)	(.086)	(.095)	(.547)
Number of observations	93	253	240	222

[a]For dependent variables, changes are calculated as the difference between three-year averages at the beginning and end of the decade.
[b]Industry imports/sales.
Standard errors are in parentheses.

Table 8

Mean Pay Gaps Among Three Broad Occupational Groups in the CSS

	Mean Log Wage Difference	
	1975	**1988**
White collar minus blue collar	0.31	0.32
White collar minus pink collar	0.52	0.66
Blue collar minus pink collar	0.21	0.33

Note: Totals do not sum exactly due to rounding.

Figure 1

Standard Deviation of CSS Wage Components Over Time (Rolling Sample, Smoothed)

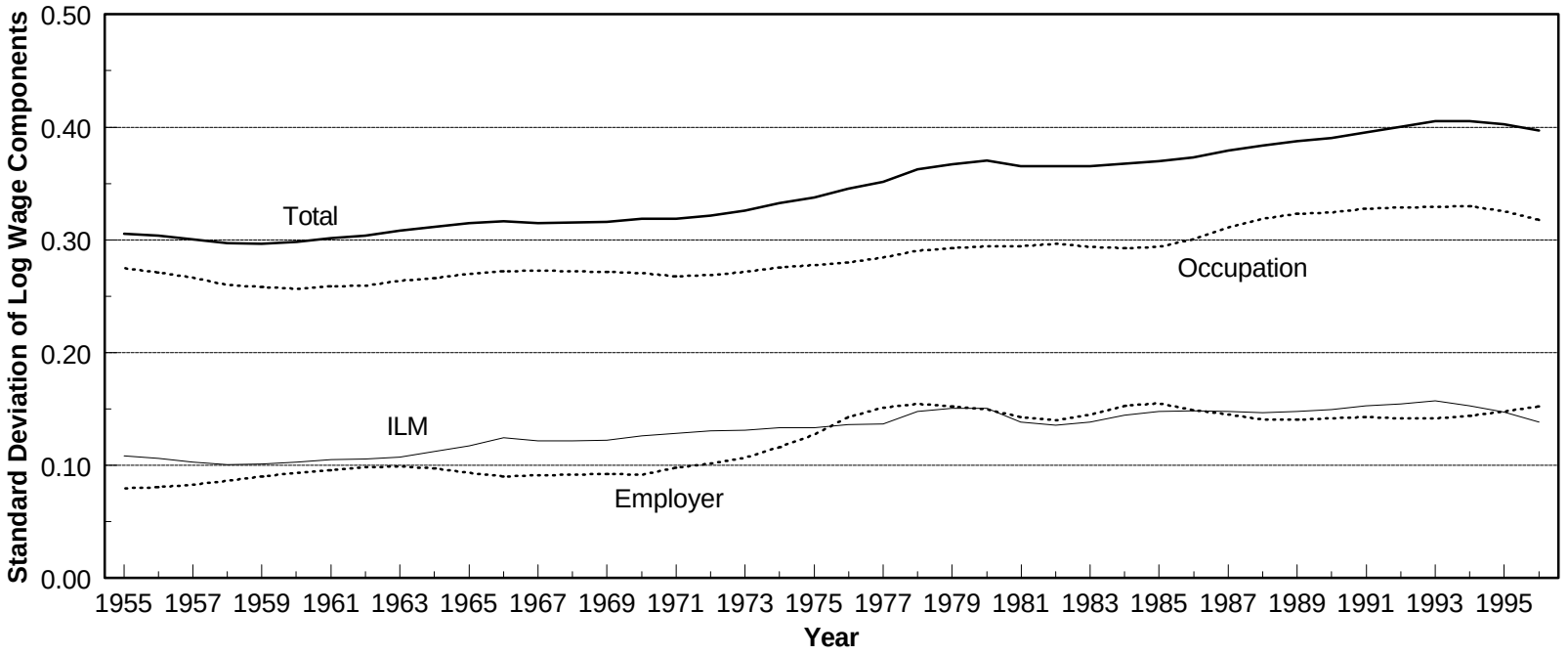

Figure 2

Covariance of Employer and Occupational Effects Over Time (Rolling Sample, Smoothed)

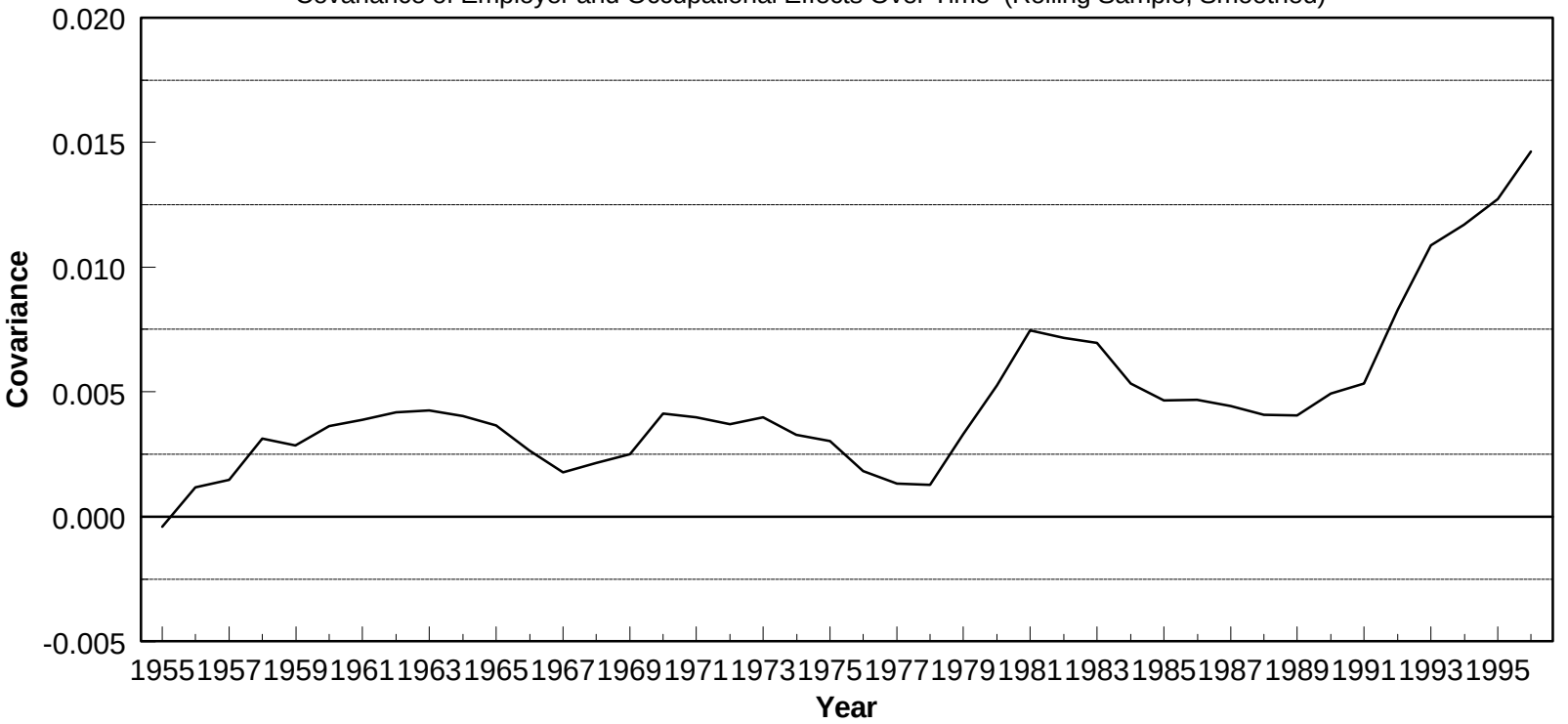

Figure 3

Occupation, Employer, and Internal Structure Wage Differential Autocorrelations

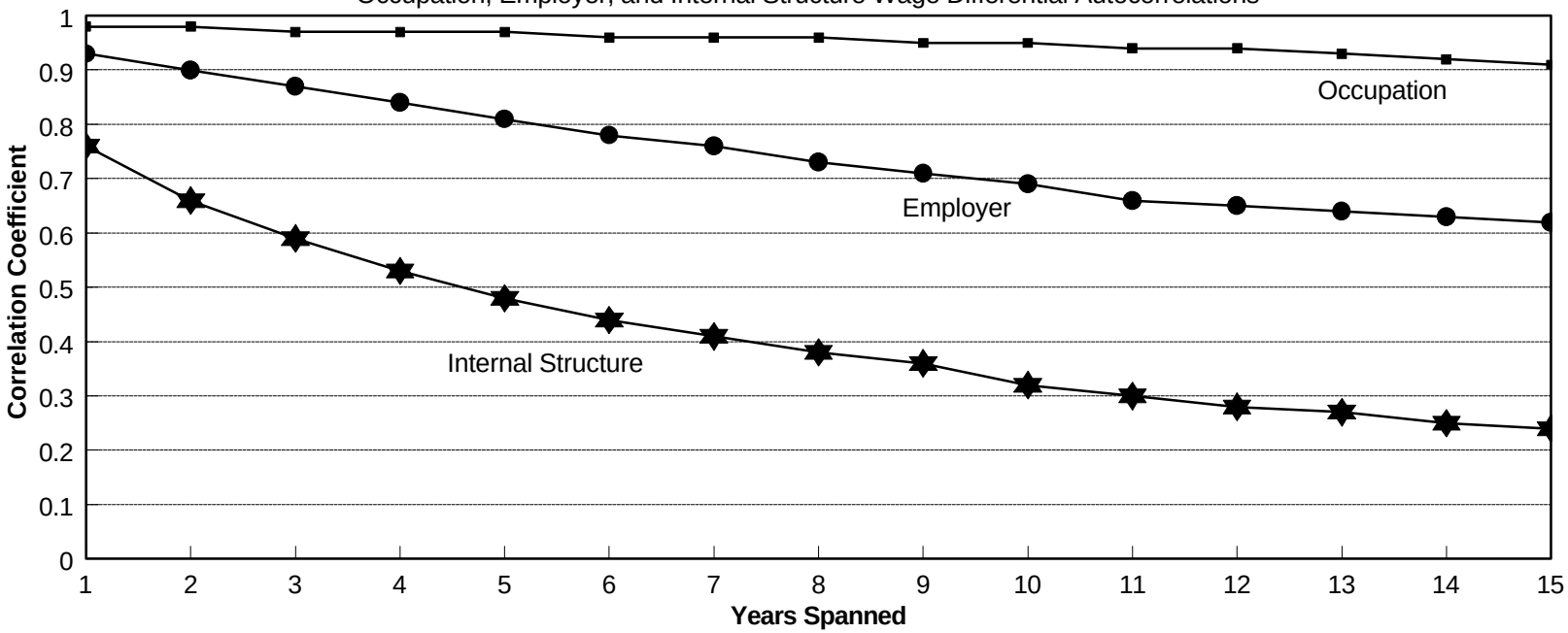

Figure 4

Occupation Autocorrelations Over Time

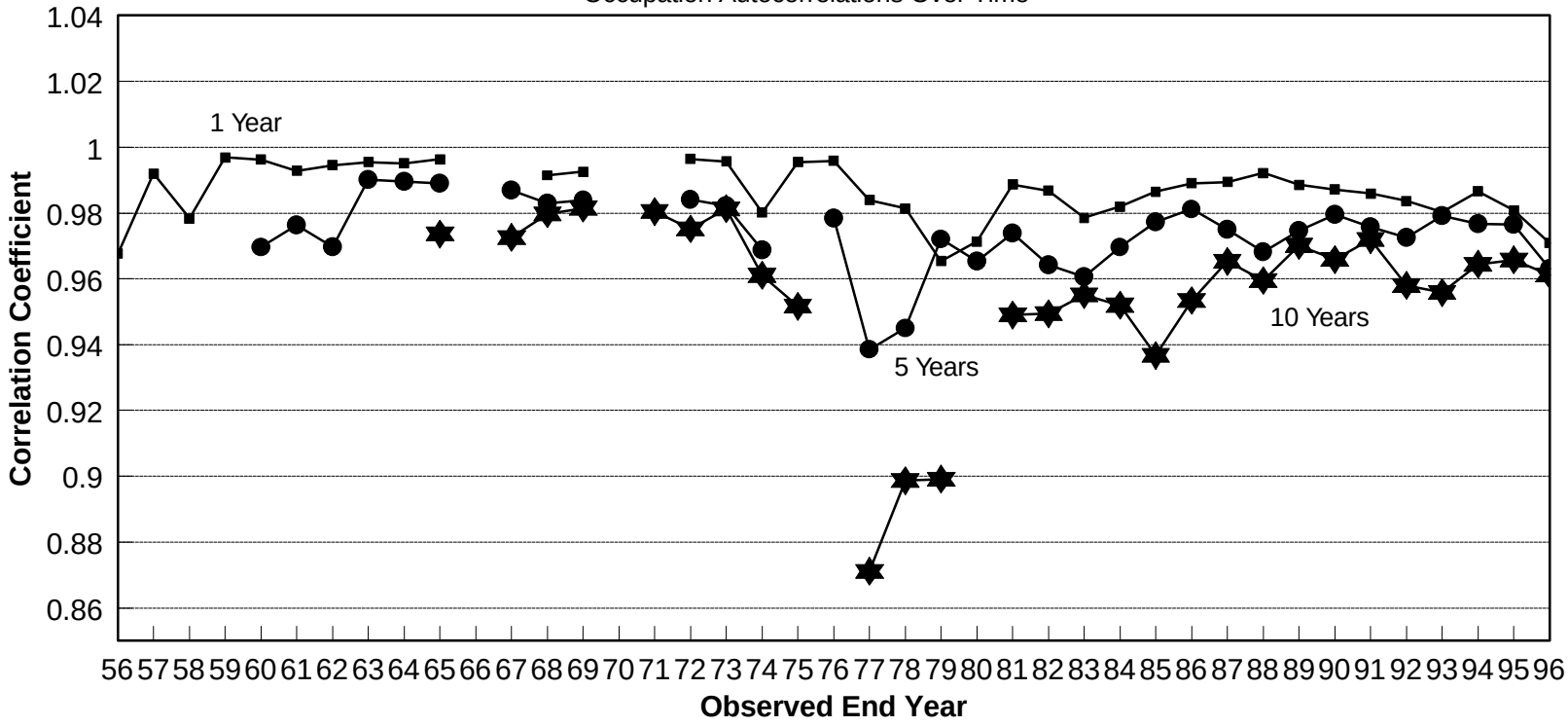

Figure 5
Employer Autocorrelations Over Time

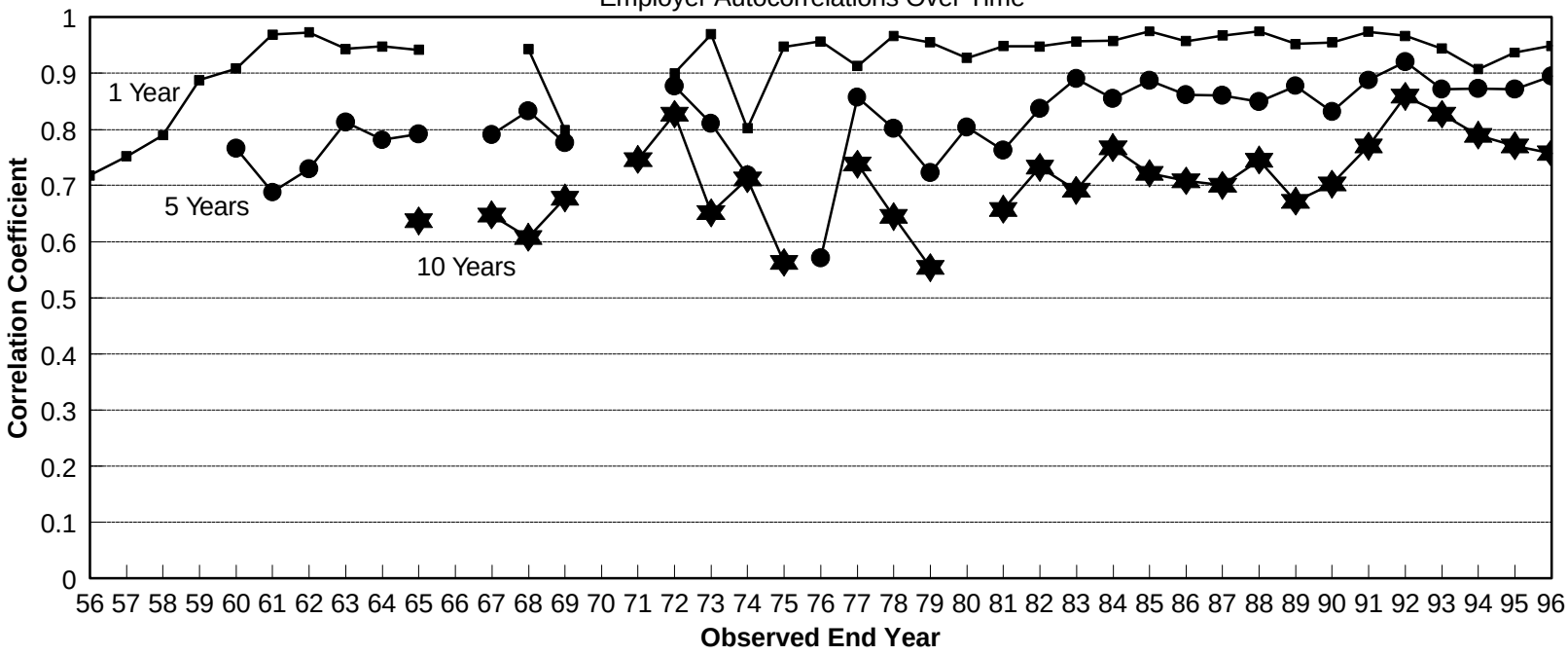

Figure 6
Internal Structure Autocorrelations Over Time

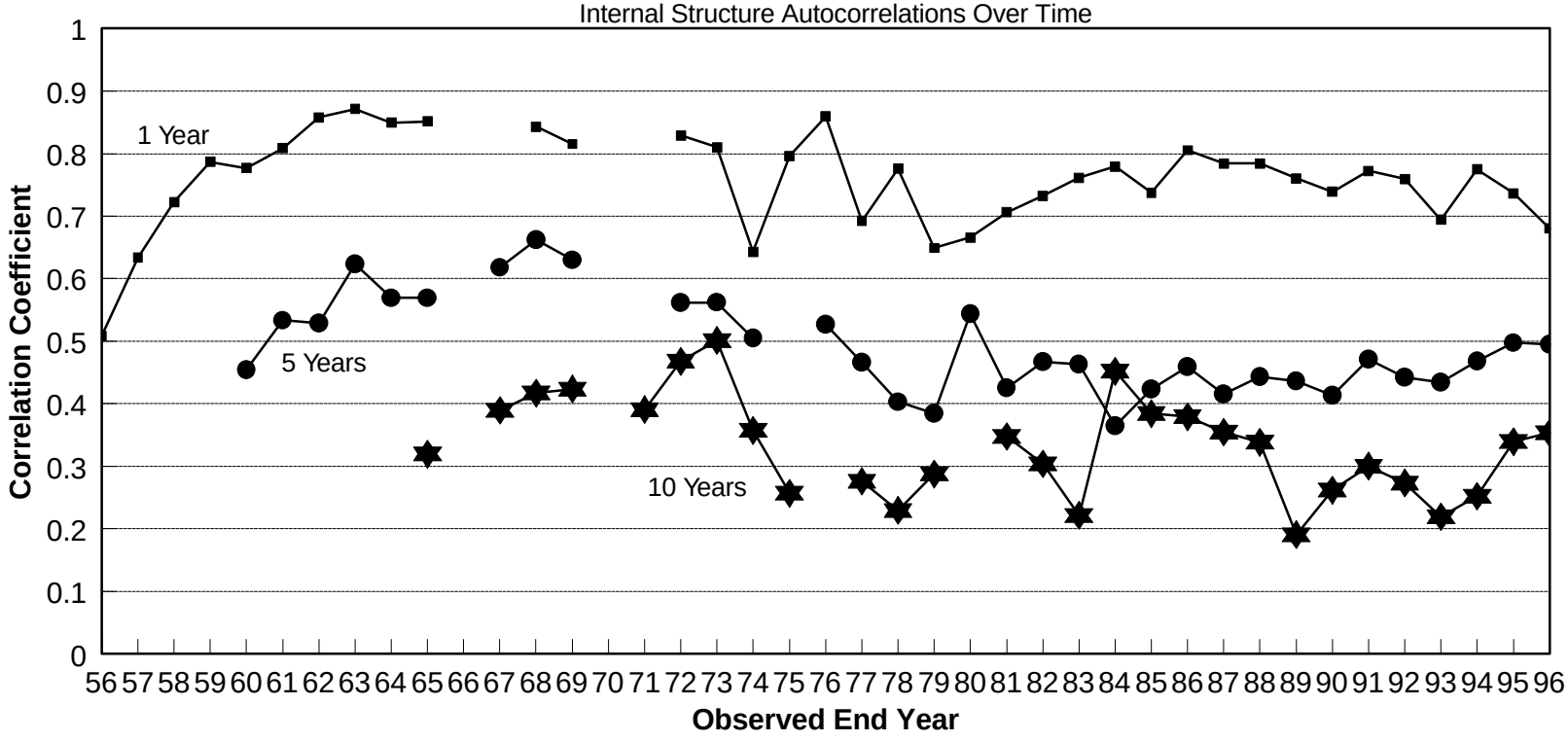

Figure 7

Variance of Occupational Wage Structure (Rolling Sample)

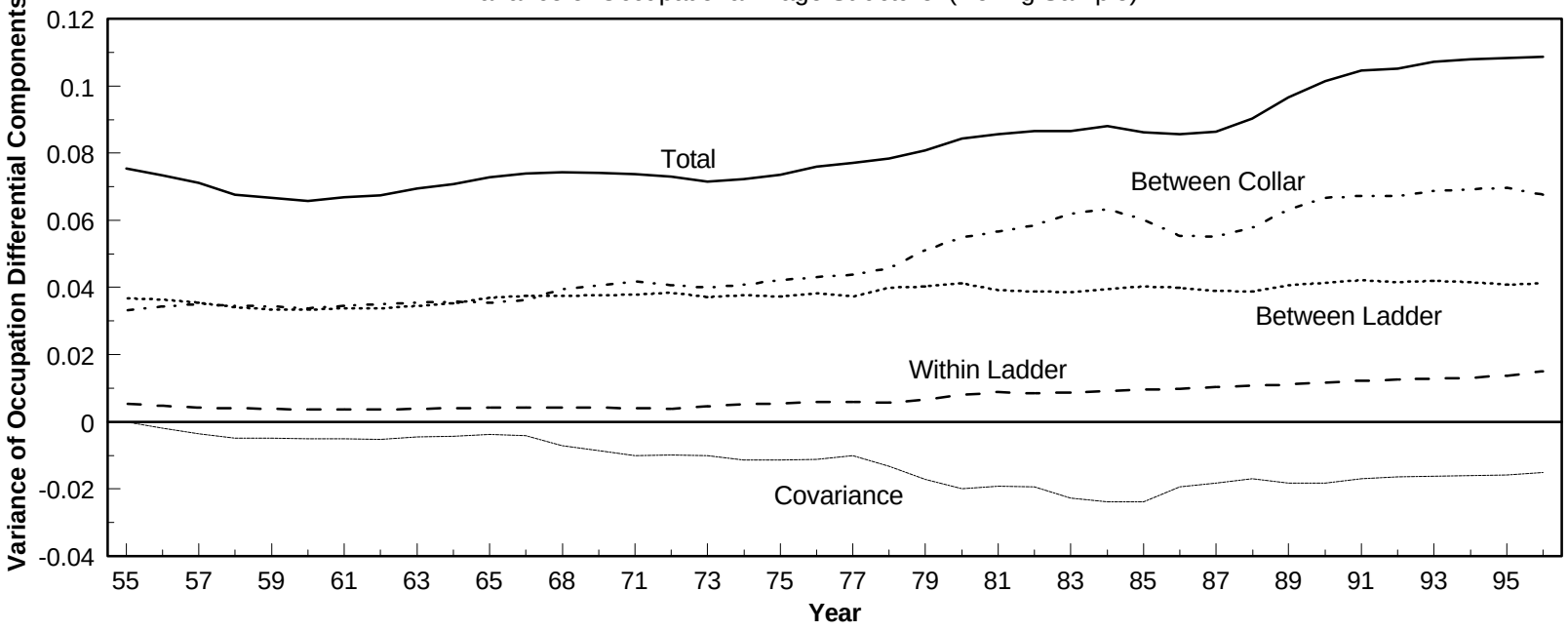

Figure 8

Occupational Differential Components Five Year Autocorrelations

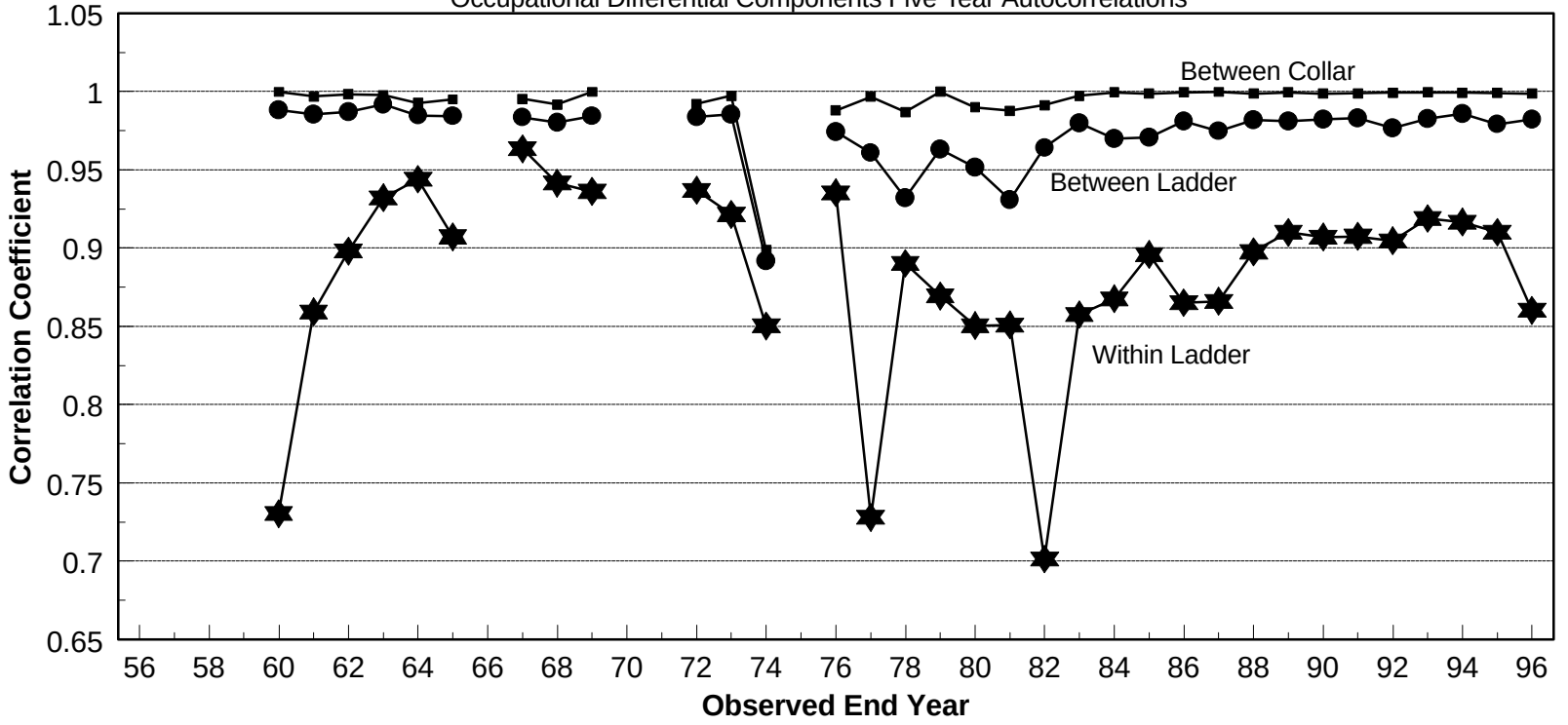

Figure 9

Variance of Internal Labor Market Structure (Rolling Sample)

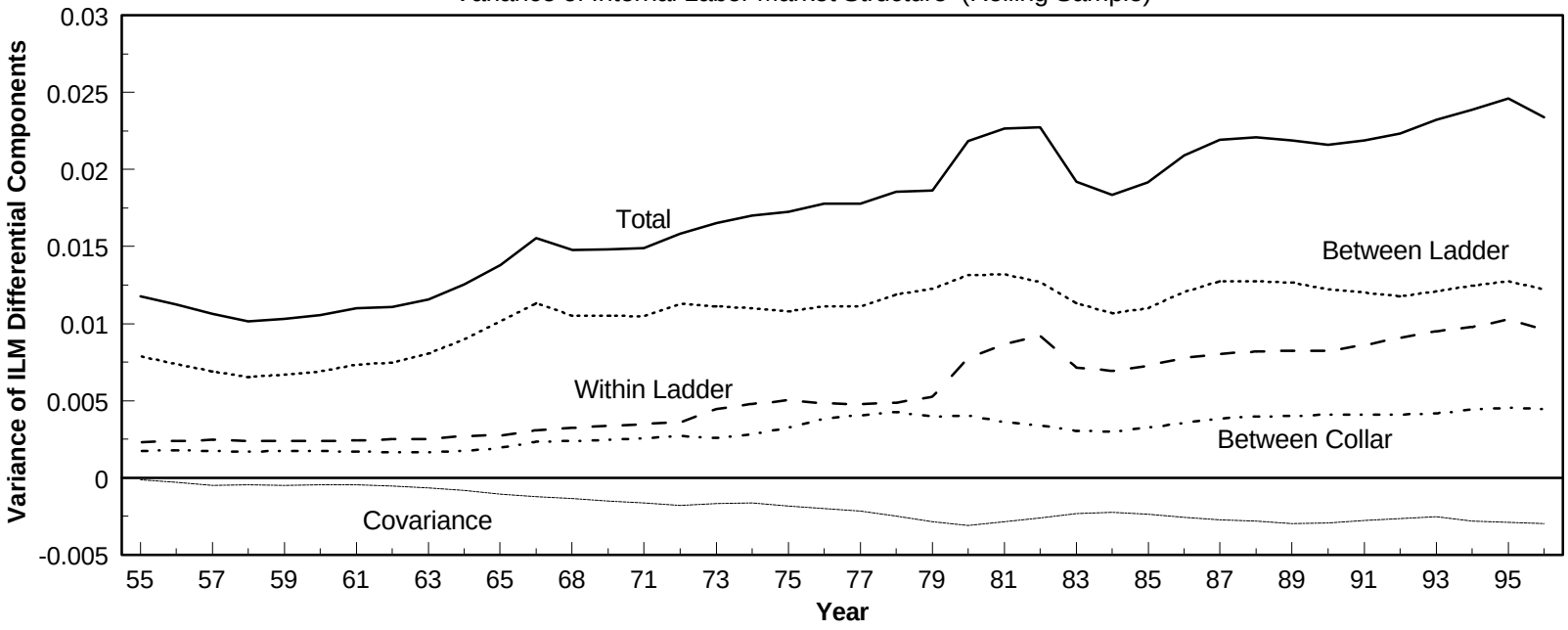

Figure 10

ILM Differential Components Five-Year Autocorrelations