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Falling Inter-Industry Wage Differentials: Has Contingent Work Had an Impact?

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This paper measures recent changes in inter-industry wage differentials, the different wages paid by different industries to apparently similar workers. These differentials historically have been remarkably stable and have been documented in the U.S. as recently as the eighties and as far back as the turn of the century (see e.g. Bell and Freeman 1991 and Allen 1995). They remain even after controlling for measurable human capital characteristics such as education and experience.

Several theories for these differentials have been posited. The first is that inter-industry wage differentials might simply reflect ability differences, unmeasured by the researcher but known to the employer. A second theory is that inter-industry wage differentials result from efficiency wages paid to workers to elicit greater effort. A third explanation is that because of higher profits and/or employee power, some industries may pay rents to their employees.

During the 1990s, various trends indicate that U.S. labor markets have become more competitive. Company downsizing, out-sourcing of jobs previously performed within the company, and increasing use of temporary workers may have created increasing competition for jobs. This increased labor market competitiveness has followed a period of increasing product market competitiveness, particularly in response to foreign competition and to deregulation.

Increasing labor market competitiveness is likely to have a profound impact on inter-industry wage differentials if these differentials at least partially reflect rents. Thus, as companies' monopoly rents fall, so

would excess wages paid. As high-paying industries move towards paying workers their outside wage, inter-industry wage differentials would fall. Similarly, firms may discontinue efficiency wages if the benefit of loyalty ties weaken.

Increasing returns to human capital would create a countervailing force tending to increase inter-industry wage differentials, since different industries employ people with differing skill levels. This factor is alleviated by controlling for measured human capital characteristics; it is not eliminated, however, if there are increasing returns to *unmeasured* human capital characteristics.

This paper finds that inter-industry wage differentials have shrunk dramatically in the period from 1983 to 1996, and particularly during the nineties. This reversal of trends is a dramatic indication of increasing labor market competitiveness. The paper further finds that the decline was particularly strong when human capital characteristics are controlled for, as predicted.

The paper then analyzes trends in *occupation-specific* inter-industry wage differentials. There are two reasons that we do this. First, changing industry/occupation employment patterns could impact measured inter-industry wage differentials, even if each employee's wages remained constant. For instance, if industries out-source non-core jobs, we would observe more concentration of occupations within industries. This would tend to raise inter-industry wage differentials by concentrating high wage occupations in a few high wage industries. We preclude this possibility when we look at occupation-specific inter-industry wage differentials and use constant occupation/industry employment weights.

A second reason for studying occupation-specific inter-industry wage differentials is to better understand the causes of changes in overall levels. A remarkable aspect of historical inter-industry wage differentials has been that they carried across all occupations within industries, from secretaries to skilled

craftspeople to executives (see, for instance, Dickens and Katz 1987; Katz and Summers 1989). This was generally seen as evidence either of rents being shared across all employees, or of the influence of equity considerations operating to compress wages within a company. In an environment of intense competitive pressures on both product and labor markets, equity considerations would become less important. Moreover, in a labor market where out-sourcing and contract work is prevalent, a worker's reference group may be transferred from the company to the occupation. Hence, we may expect to find inter-industry wage differentials fall most in non-core occupations, for instance in those occupations which tend to be out-sourced. This paper tests these hypothesized correlates of trends in occupation-specific inter-industry wage differentials.

Data and Methodology

Inter-industry wage differentials were measured from wage data on the out-going rotation groups of the Current Population Survey. Being individual-based, industry wage differential estimates using CPS data will cover fewer total employees than estimates using establishment surveys. The CPS, however, allows disaggregation by detailed occupational classifications.

The analysis excludes governmental or self-employed workers. The 42 industries are basically equivalent to the 2 digit industry recodes in the CPS, but adjusted to ensure consistent industry definitions across the entire period. Occupations were divided into 44 occupations approximately identical to the CPS 2-digit categories, with some minor adjustments to ensure that occupational categories were more homogeneous (in terms of human capital). For the occupation-specific estimates, I excluded occupations employed in very few industries, leaving 34 occupations.

Inter-industry wage differentials may occur because different industries tend to employ people with differing amounts of human capital. As such, it is informative to measure differentials both controlling for measurable human capital and without these controls. Both approaches are reported here. The specific measure calculated is the square root of the (weighted) cross-industry variance of average log wages, subtracting out the variance expected from sampling error. When human capital controls are included, the variances are based on the industry dummies from estimated log wage equation that include industry dummy variables as well as education dummies, age and age squared, sex, region, race dummies, a city center dummy variable as well an SMSA dummy variable, a dummy variable for jobs covered by collective bargaining and a dummy variable for hourly workers.

In all analysis, industry-specific wages are weighted by 1988 employment. By using constant weights, changes in the industrial composition of employment are not allowed to obscure changes in industry wage differentials.

I follow the basic approach of Krueger and Summers 1988 to adjust for sampling error. However, the formula is adjusted to incorporate the weights and to correct for covariance between regressors. Krueger and Summers made the simplifying assumption to ignore covariance terms because it introduced very little bias in their computations. Here, this assumption would have been introduced substantial bias in the present analysis, particularly in the occupation-specific estimates.

To measure the extent of contract work and other contingent work in the labor market, we relied on the February 1995 Contingent Work Supplement to the CPS. Note that this only measured the extent of contingent work at a single point of time and hence could not be used to measure trends.

Results

Overall Inter-Industry Wage Differentials

Table 1 presents results on inter-industry wage differentials for the overall U.S. labor market. We see in the first row that wage differentials not controlling for changes in measurable human capital characteristics do not indicate a single trend from 1983 to 1996. The wage differentials increased from 1983 to 1990 and subsequently fell, with the fall particularly marked from 1993 to 1996.

In contrast, the second row, which controls for human capital, indicates a strong monotonic downward trend over the whole period. Inter-industry wage differentials fell by 30% from 1983 to 1993, the majority of the fall occurring between 1993 and 1996. (Note that the same trends are observed if we look at the standard deviation of wage differentials without adjusting for estimated measurement error.) The differences between the two rows is consistent with increasing returns to human capital during the eighties that slowed during the nineties.

This remarkable decline in inter-industry wage differentials marks the definitive end of a trend of rising inter-industry wage differentials since 1970 (and since before 1950 in manufacturing industries) as documented by, among others, Allen 1995, Bell and Freeman 1991, Dickens and Katz 1989 and Krueger and Summers 1988. Allen 1995 covers a time period as recent as 1990, thus overlapping this paper and providing an interesting comparison. Allen found rising inter-industry differentials in manufacturing (not controlling for human capital) from the fifties through 1990, although one of Allen's measures of industry wage differentials did begin to drop in the late eighties. Limiting my analysis to manufacturing industries, I find no clear pattern 1983 to 1993 but a clear drop after that point, with or without human capital controls.

Occupation-Specific Wage Differentials

The theoretical considerations suggested that we could more accurately measure inter-industry wage differentials if we could control for changing occupational distributions of industries, and that one way to do this was to measure *occupation-specific* inter-industry wage differentials. These measures would also allow us to test hypotheses about the causes of falling inter-industry wage differentials.

Table 2 shows the change in industry wage differentials from 1983 to 1996 for 34 occupations based on human capital log wage equations. The order of magnitude of 1983 inter-industry wage differentials was remarkably similar across occupations, ranging from .05 to .16 for all but 3 of the 34 occupations. During the subsequent thirteen years, the industry wage differential fell in 30 of the 34 occupations. In fact, in one occupation (commodities sales representatives), the inter-industry variance in wages in 1996 was actually estimated to be negative, i.e. the variance of average industry wage differentials was actually smaller than the variance expected from measurement error alone.

The (weighted) average of occupation-specific inter-industry standard deviations in Table 2 decreased by .024 from 1983 to 1996, or more than twice the change observed in Table 1. (This calcu-lation treats the 1996 value for commodities sales representatives as zero.) Thus, rather than changing occupational distributions being responsible for narrowing inter-industry wage differentials, we find that occupation-specific inter-industry wage differentials have fallen even more than overall levels.

Contingent Work and Occupation-Specific Inter-Industry Wage Differentials

To measure the relation between contingent work and falling industry wage differentials, the occupation-specific percentage changes in industry wage differentials were regressed on measures of

contingent employment as a proportion of each occupation. These regressions included only 33 observations of two-digit occupations and as such were not expected to yield highly significant results. (Note that commodities sales representatives were dropped.)

A wide variety of measures of contingent work were used, all based on the February 1995 CPS Contingent Work Supplement. These included:

1) The CPS definitions of contingent work. The most narrow CPS definition included temporary workers, people with job tenure of a year or less and people who expected their job to last less than a year (for non-personal reasons). The wider definitions added independent contractors, self employed and people whose work was contracted out.

2) I also constructed measures of contingent work that did not include all people with less than one year seniority. One constructed measure included only temporary and on-call workers, another measured only self-employed and independent contractors, while other definitions included both these categories and/or added in people working for firms which contract out their services.

3) Finally, I entered each separate category of contingent worker separately, i.e. temporary workers, on-call workers, independent contractors, people whose firms contract out their labor.

Measures of contingent work that included the self-employed, independent contractors and/or people whose work was contracted out (but did not include all people with low job tenure) had the most significant impact. The t-statistic on the impact of the proportion of the occupation that was in one of these three categories was -1.95. The magnitude of the coefficient was -.51, so that an occupation with a one percentage point higher proportion of self employed or contract workers would tend to have a .5% smaller inter-industry wage differential. (A robust regression to minimize the impact of outliers brought the t-statistic

down to 1.85 but hardly impacted the magnitude of the impact.) This result confirms that one factor that may have contributed toward decreasing inter-industry wage differentials is increased competitiveness in occupations with substantial numbers of self-employed or independent contractors. However, as of February 1995 this represented less than 13% of the labor market. Given the magnitude of the estimated coefficient, increases in the size of this group between 1983 and 1996 could not be responsible for more than one third of the fall in inter-industry wage differentials even if not a single person was self-employed or contracted-out in 1983. Measures of contingent work that included only temporary workers, on-call workers and/or workers with low tenure had no discernible correlation with the occupation-specific fall in wage differentials. We must look beyond the competitive pressures placed by contingent and contract workers to explain the large drop in inter-industry wage differentials observed in the nineties.

Conclusion

This paper shows evidence of decreasing inter-industry wage differentials in the late eighties and in the nineties. A disaggregated view by occupation finds that inter-industry wage differentials fall for practically all occupations. The only two occupations with a considerable increase in industry wage differentials were "computer equipment operators" and "teachers (non-college or university), librarians and curators." While we found some correlation between occupations with large decreases in inter-industry wage differentials and the proportion of the employment in an occupation which is self-employed or contracted out, this can account for a relatively small proportion of the fall in inter-industry wage differentials. These findings call for additional research on these inter-industry differentials to identify the causes of falling industry wage differentials and their future course.

Table 1
Standard Deviation Across Industries of Ln(Wage)

	1983	1988	1990	1993	1996
standard deviation of industry ln(wage)	.2442	.2440	.2472	.2453	.2339
standard deviation of industry parameters in ln(wage) human capital equation	.1759	.1732	.1685	.1671	.1469

All numbers weighted by 1988 employment. Estimated measurement error is subtracted out. See text for more details.

Table 2: Changes in Inter-Industry Wage Differentials by Occupation: 1983 to 1996

	standard dev. 1983	standard dev. 1996	% change	%self-employed, contract workers	# industries	# in sample
Executives, Administrators, Managers	0.1667	0.1414	-15.18	0.26	62	2099
Management Related Occupations	0.0944	0.0570	-39.66	0.15	49	846
Engineers, Architects and Surveyors	0.0565	0.0573	1.46	0.09	27	418
Mathematical Computer Scientists	0.0748	0.0490	-34.55	0.13	16	244
Natural Scientists	0.2660	0.2149	-19.21	0.09	5	78
Health Assessment and Treating Occupations	0.0680	0.0581	-14.59	0.04	5	565
Teachers (exc.college/univ.), librarians,curators	0.0769	0.0848	10.32	0.05	5	350
Counselors, Social Workers, Religious Workers	0.1190	0.0734	-38.29	0.04	8	234
Designers, Artists, Athletes, Writers, Editors	0.1182	0.1059	-10.37	0.37	25	341
Engineering and Science Technicians	0.0854	0.0595	-30.29	0.05	26	221
Technicians exc. Engineering, Science, Health	0.1444	0.0807	-44.08	0.09	23	210
Sales Occupations, Supervisors and Proprietors	0.1287	0.1058	-17.76	0.34	12	796
Sales Representatives, Business Services	0.0797	0.0413	-48.09	0.43	12	368
Sales Representatives, Commodities	0.0673	n.a.	n.a.	0.15	17	319
Sales Representatives, Retail & Personal Svce.	0.0452	0.0437	-3.37	0.10	16	1479
Supervisors - Administrative Support	0.0925	0.0857	-7.38	0.01	15	130
Computer Equipment Operators	0.0684	0.0928	35.66	0.03	16	109
Secretaries, Stenographers, Typists	0.0829	0.0655	-21.00	0.06	52	806
Record Processing,Admin.Support Occs: high wage	0.1177	0.0998	-15.21	0.03	50	933
Record Processing,Admin.Support Occs: low wage	0.1021	0.0695	-31.87	0.08	56	1504
Protective Service Occupations	0.1097	0.1034	-5.77	0.05	10	161
Food Service Occupations	0.0777	0.0768	-1.12	0.02	12	1415
Health Service Occupations	0.1482	0.0736	-50.31	0.04	7	510
Cleaning and Building Service Occupations	0.1305	0.0977	-25.17	0.09	30	553
Personal Service Occupations	0.1745	0.0931	-46.64	0.41	10	410
Mechanics and Repairers	0.1564	0.1104	-29.39	0.13	47	857
Extractive and Precision Production Occupations	0.1290	0.1113	-13.74	0.08	46	876
Machine Operators and Tenders (exc. Precision)	0.1466	0.1260	-14.02	0.03	43	1170
Fabricators, Assemblers, Inspectors, Samplers	0.1241	0.1268	2.14	0.07	36	571
Motor Vehicle Operators	0.1132	0.0958	-15.44	0.13	30	730
Other Transportation Operators, Material Moving	0.1329	0.0906	-31.82	0.06	24	247
Construction Laborers and Trades (exc. Supervisors)	0.0814	0.0605	-25.58	0.31	27	859
Freight, Stock and Material Handlers	0.1252	0.1148	-8.28	0.02	23	450
Other Handlers, Equipment Cleaners, Laborers	0.1584	0.1132	-28.54	0.04	37	516

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