

An Investigation of Industry and Size Effects on Wage Dispersion

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The existence of wage dispersion in an industry is a perplexing problem. For example, why would accountants working in the same industry earn vastly different incomes? Why are wages divergent or convergent for the same occupation dependent on the industry? There are several possible reasons.

One, there are size differences between firms. In general, the larger the firm, the more likely it will pay higher wages. This is due, in theory, to the phenomenon of “rent sharing.” Firms share rents (profits) with workers to prevent shirking, labor turnover, and disruptions to the firms’ own rent seeking. Smaller firms have more variation in the amount of rent available to share with workers. This will lead to higher wage dispersion in industries dominated by small firms.

Two, firms in the same industry may have dissimilar employment wage practices. The less structured the industry’s wage practices, the greater the wage dispersion. By contrast, industries that are highly unionized may have tighter or more structured wage practices. In theory, this would lead to lower wage dispersion.

Three, there are skill level and seniority differences between individuals in the labor market. Finally, there may be differences within an industry as to skill requirements, job duties, or working environments that result in intraindustry wage differences. The labor market may work to sort individuals into industries such that workers within an occupation in some industries have a narrow range of skills and responsibilities, while workers in the same occupation in other industries may have a wider range of responsibilities and skills.

We use the OES occupational wage data to see which industries have high and low wage dispersion. We then see whether they have common characteristics—whether they are dominated by small or large firms, for example, or whether there are differences in industry wage practices, an example being union affiliation employment rates.

Measuring industry occupation wage dispersion

For each three-digit NAICS industry, dispersion ratios were

calculated for six occupations that are found in every industry. The six occupations are: Accountants and auditors; first-line supervisors/managers of office and administrative support workers; bookkeeping, accounting, and auditing clerks; executive secretaries and administrative assistants; secretaries, except legal, medical, and executive; and general office clerks. Using these six occupations in this study limits, in part, the effects of industry wage differences due to varying job content within the occupation because workers in these six occupations have similar duties and working environments.

To generate a dispersion ratio, the 10th-percentile wage rate was subtracted from the 90th-percentile wage rate, and the difference was divided by the median wage rate. If the ratio is below 1, the difference between the 90th- and 10th-percentile wages is less than the median wage. If the ratio equals 1, the difference between the 90th and 10th percentiles equals the median. Finally, if the ratio is greater than 1, the difference between the 90th and 10th percentiles is greater than the median.

Following the generation of the dispersion ratio, the six occupations were sorted and ranked by their respective dispersion ratios. This provides a relative measure of industry wage dispersion; each industry was given a dispersion score equal to the sum of the dispersion ranks for each of the six occupations in the industry. Text table 1 shows the relative ranks of wage dispersion for all three-digit NAICS. It is sorted in an ascending manner from lowest wage dispersion to highest wage dispersion. The fourth column, sum of ranks, is the sum of the relative wage dispersion ranks for the six occupations. The table illustrates that wages for the six occupations in this study were, on average, closely clustered in hospitals, air transportation, monetary authorities, social assistance, and rail transportation. Wages were more highly dispersed in securities, commodities, contracts and investments; apparel manufacturing; membership associations; gasoline stations; and lessors of nonfinancial intangible assets.

Union participation

In order to test the theory that wage dispersion would be lower in industries with high union affiliation rates, the re-

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sults from text table 1 were related to the Current Population Survey (CPS) union affiliation rates for two- or three-digit NAICS industries. Because CPS estimates are published by three-digit NAICS category for a limited number of industries, only 6 of the 88 industries in text table 1 could be directly related to union affiliation rates. As a result, 82 of the three-digit NAICS industries are related to two-digit NAICS union affiliation rates. For the purposes of this inquiry, the industries in text table 1 were divided into four groups, based on their respective dispersion ranks. The average union affiliation rate for each of the four groups was calculated using the CPS data. The results are shown in text table 2.

The summary data in text table 2 illustrates that industries with lower wage dispersions have higher union affiliation rates, supporting the hypothesis that, as unionization rates decrease, wage dispersion increases. There may be exceptions to this general observation that are not apparent in the table because average union affiliation rates were used in the absence of data at the more detailed three-digit NAICS level. Despite this caveat, the data suggest that there is a unionization effect on wage dispersion. For instance, the average union affiliation rate of the 22 industries with the lowest dispersion ranks is 16.4 percent. The union affiliation rates for three-digit NAICS groupings decline until they reach a low of 6.8 percent for the 22 industries with the highest wage dispersion.

Effects of employer size

To test the firm-size theory, which is that three-digit NAICS industries that are populated by a preponderance of small firms will have high wage dispersion, employment in each three-digit NAICS category was divided into three size classes. The small size class refers to the sum of employment by three-digit NAICS for firms with fewer than 50 employees. Medium size class is defined as the sum of employment by three-digit NAICS for firms with 50 to 249 employees. The large size class is defined as the sum of employment by three-digit NAICS for firms with 250 or more employees. For this study, a three-digit NAICS industry is defined as being dominated by small, medium, or large firms whenever 50 percent or more of total employment is found in one of the size classes. The results are shown in text table 3.

Text table 3 illustrates the relationship between firm size, the dominance of firm size in a three-digit NAICS industry, and wage dispersion. The hypothesis is that, as small firms dominate a three-digit NAICS category, the wage dispersion will increase due to greater variability in rent sharing in small firms than in large firms. The data demonstrate that this is the case. As wage dispersion increases, dominance by small firms increases. Industries with the smallest wage

dispersion (groups 1-22) are the likeliest to be dominated by large firms, with 11 three-digit NAICS industries being so dominated while only 3 three-digit NAICS industries in the same group are dominated by small firms. At the opposite end of the wage dispersion spectrum, there are 12 three-digit NAICS categories dominated by small firms in the industries with the highest wage dispersion (groups 67-88), whereas there are no three-digit NAICS industries dominated by large firms in that group.

To further test whether there is a relationship between the industry's dispersion ratio and firm size, dispersion ranks were correlated to the industry's average firm size. Data from the Bureau of Labor Statistics 2003 Quarterly Census of Employment and Wages were used to calculate the average firm size by three-digit NAICS code. The result of this test was a correlation coefficient of -.40, which indicates that, as firm size increases, the wage dispersion rank decreases. The industries' average firm size and dispersion ranks are shown in text table 4.

Discussion and summary

The purpose of this article was to investigate the relationships between wage dispersion, industry wage practices, and firm size. The case for wage dispersion being related to industry wage practices was supported using CPS union affiliation data for industries. While a detailed industry analysis could not be conducted, available data shows that there seems to be an effect. The evidence for a dominant firm size effect was stronger. When wage dispersion was higher, small firms dominated more of the three-digit NAICS category. Conversely, if large firms dominated more of the three-digit category, wage dispersion was lower.

Of course, there are limitations to this study. The occupations used to generate the wage dispersion ratio are located in only two occupational groups: Business and financial operations and office and administrative support. While using these occupations for analysis may have its advantages, using a larger number of occupations may provide additional information on wage dispersion, but this will be left for a future study. As mentioned previously, almost all of the CPS unionization data related to the two-digit NAICS level. If the CPS ever yields industry data at the three-digit NAICS level for all 88 industries used in this study, a more precise result would be obtained. Finally, the existence of skill and seniority differences within occupations was not accounted for in this study.

In summary, OES data support the theory that wage dispersion will be greatest in industries that have an unstructured wage policy and in those that are dominated by small firms, due to the variability of rent sharing. ■

Text table 1. Wage dispersion ranks by industry

Industry ranks	NAICS	NAICS title	Sum of ranks	Industry ranks	NAICS	NAICS title	Sum of ranks
1	622000	Hospitals	34	49	316000	Leather and allied product manufacturing	297
2	481000	Air transportation	49			Electronics and appliance stores	298
3	521000	Monetary authorities—central bank	58	50	443000	Merchant wholesalers, nondurable goods	298
4	624000	Social assistance	70	51	424000	Construction of buildings	298
5	482000	Rail transportation	79			Oil and gas extraction	303
6	322000	Paper manufacturing	82	52	236000	Nonstore retailers	305
7	331000	Primary metal manufacturing	102	53	211000	Waste management and remediation services	313
8	326000	Plastics and rubber products manufacturing	105	54	454000	Rental and leasing services	318
9	623000	Nursing and residential care facilities	112	55	562000	Real estate	320
10	486000	Pipeline transportation	117	56	532000	Other information services	320
11	517000	Telecommunications	130	57	531000	Wholesale electronic markets and agents and brokers	320
12	325000	Chemical manufacturing	147	58	519000	Sporting goods, hobby, book, and music stores	321
13	492000	Couriers and messengers	149	59	425000	Building material and garden equipment and supplies dealers	322
14	621000	Ambulatory healthcare services	159			Heavy and civil engineering construction	328
15	311000	Food manufacturing	160	60	451000	Motion picture and sound recording industries	338
16	327000	Nonmetallic mineral product manufacturing	160			Support activities for transportation	344
17	721000	Accommodation	163	61	444000	Furniture and home furnishings stores	350
18	483000	Water transportation	170			Scenic and sightseeing transportation	355
19	333000	Machinery manufacturing	175	62	237000	Miscellaneous store retailers	355
20	493000	Warehousing and storage	179			Support activities for agriculture and forestry	356
21	335000	Electrical equipment, appliance, and component manufacturing	181	63	512000	Funds, trusts, and other financial vehicles	361
22	312000	Beverage and tobacco product manufacturing	184	64	488000	Repair and maintenance	369
23	334000	Computer and electronic product manufacturing	195	65	442000	Support activities for mining	373
24	611000	Educational services	200	66	487000	Health and personal care stores	377
25	999000	Federal, State, and local government (OES designation)	202	67	453000	Publishing industries (except Internet)	379
26	336000	Transportation equipment manufacturing	206	68	115000	Internet service providers, Web search portals, and data processing service	383
27	522000	Credit intermediation and related activities	207	69	525000	Broadcasting (except Internet)	383
28	221000	Utilities	214	70	811000	Food services and drinking places	385
29	337000	Furniture and related product manufacturing	219	71	213000	Motor vehicle and parts dealers	386
30	445000	Food and beverage stores	221	72	446000	Performing arts, spectator sports, and related industries	387
31	516000	Internet publishing and broadcasting	223	73	511000	Personal and laundry services	395
32	314000	Textile product mills	234	74	518000	Forestry and logging	399
33	321000	Wood product manufacturing	234	75	515000	Specialty trade contractors	400
34	332000	Fabricated metal product manufacturing	236	76	722000	Professional, scientific, and technical services	411
35	339000	Miscellaneous manufacturing	239	77	441000	Clothing and clothing accessories stores	415
36	561000	Administrative and support services	241	78	711000	Lessors of nonfinancial intangible assets (except copyrighted works)	419
37	551000	Management of companies and enterprises	250	79	812000	Gasoline stations	424
38	452000	General merchandise stores	251	80	113000	Religious, grantmaking, civic, professional, and similar organizations	432
39	712000	Museums, historical sites, and similar institutions	252	81	238000	Apparel manufacturing	450
40	323000	Printing and related support activities	253	82	541000	Securities, commodity contracts, and other financial investments and related activities	462
41	484000	Truck transportation	260	83	448000		
42	524000	Insurance carriers and related activities	263	84	533000		
43	313000	Textile mills	266				
44	4485000	Transit and ground passenger transportation	266	85	447000		
45	324000	Petroleum and coal products manufacturing	275	86	813000		
46	423000	Merchant wholesalers, durable goods	282	87	315000		
47	212000	Mining (except oil and gas)	296	88	523000		
48	713000	Amusement, gambling, and recreation industries	297				

Text table 2. Effects of union representation on wage dispersion

Industry rank by dispersion ratio	CPS average percent of employed represented by unions, 2003, by dispersion groups ¹
1-22	16.4
23-44	14.8
45-66	10.8
67-88	6.8

¹ Data refer to members of a labor union or an employee association similar to a union, as well as to workers who report no union affiliation but whose jobs are covered by a union or an employee association contract.

Text table 3. Effects of firm size on wage dispersion

Industry rank	Count of three-digit NAICS industries dominated by 1 of 3 size classes			
	Small	Medium	Large	Not dominated
1-22	3	1	11	7
23-44	0	1	6	15
45-66	9	0	1	12
67-88	12	0	0	10

Text table 4. Effect of firm size on wage dispersion

Industry ranks	NAICS	Average firm size	Industry ranks	NAICS	Average firm size	Industry ranks	NAICS	Average firm size
1	622000	707	31	516000	9	61	444000	20
2	481000	105	32	314000	23	62	237000	19
3	521000	129	33	321000	31	63	512000	15
4	624000	22	34	332000	24	64	488000	17
5	482000	12	35	339000	21	65	442000	11
6	322000	88	36	561000	21	66	487000	11
7	331000	78	37	551000	48	67	453000	8
8	326000	56	38	452000	199	68	115000	20
9	623000	76	39	712000	38	69	525000	15
10	486000	49	40	323000	17	70	811000	6
11	517000	58	41	484000	13	71	213000	21
12	325000	66	42	524000	14	72	446000	20
13	492000	51	43	313000	56	73	511000	28
14	621000	11	44	485000	36	74	518000	19
15	311000	58	45	324000	67	75	515000	39
16	327000	35	46	423000	12	76	722000	22
17	721000	34	47	212000	33	77	441000	19
18	483000	40	48	713000	25	78	711000	10
19	333000	35	49	316000	31	79	812000	8
20	493000	48	50	443000	12	80	113000	7
21	335000	64	51	424000	16	81	238000	9
22	312000	54	52	236000	7	82	541000	8
23	334000	69	53	211000	19	83	448000	17
24	611000	125	54	454000	15	84	533000	9
25	999000	95	55	562000	18	85	447000	14
26	336000	125	56	532000	16	86	813000	11
27	522000	35	57	531000	6	87	315000	24
28	221000	52	58	519000	25	88	523000	13
29	337000	24	59	425000	4			
30	445000	26	60	451000	13			

Correlation coefficient = -.40