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Employer Size Effects for Workers vs. Supervisors: British Survey Data

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Employer Size Effects for Workers vs. Supervisors: British Survey Data

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Abstract: Using British linked employer-employee data, we show that the establishment size effect for supervisors is approximately twice that for non-supervisors. This difference is routinely statistically significant, not explained by other controls and an important determinant of the difference in earnings between supervisors and non-supervisors.

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1. Introduction

Economists have long debated why larger employers pay higher wages. Despite at least seven different theoretical explanations that have been tested and often found wanting (Oi and Idson 1999; Brown and Medoff 1989, Belfield and Wei 2004), one vein of theory suggests that the size effect is largely a hierarchical phenomenon. Larger employers typically have both larger hierarchies and wider spans of control. The return to superior management is greater for these employers and so efficient assignment argues that more talented managers should match with larger firms (Tervio 2008, Gabaix and Landier 2008). We provide an indirect test of this hypothesis.

Using linked employer-employee data from Britain, we find substantially larger returns to employer size for those with supervisory duties. This supports hierarchy theory by revealing that a disproportionate share of the employer size effect is concentrated among those with managerial duties. It also fits the observation that large firms hire workers with greater unobserved ability (Abowd et al., 1999) and that the unobserved ability is mostly managerial.

Meagher and Wilson (2004) examine a cross-section of Australian workers in the 1980s showing that the employer size effect is significantly larger among those with supervisory duties. Moreover, the difference in the returns they find is not explained by the other available controls. More recently, Mueller et al. (2016) use proprietary pay surveys matched to administrative data to examine pay inequality within firms. They show that pay differentials between jobs (not workers) that involve no managerial responsibility are invariant to firm size. At the same time, the pay disparity between jobs with managerial responsibility and those without grows dramatically with firm size. Thus, both an examination of workers and of jobs argues for the importance of hierarchy theory.

We provide the first examination using linked employer-employee data. We show that the return to employer size for those with supervisory duties is roughly twice as large as for those without. This difference is routinely statistically significant, not explained by other controls and an important determinant of the difference in earnings between supervisors and non-supervisors.

2. Data and Variables

We draw data from the 2011 Workplace Employment Relations Survey (WERS), a stratified sample of British workplaces (Van Wanrooy et al., 2013). WERS links establishment level questions asked of senior managers with questionnaires from 25 randomly selected employees in each workplace, or from all employees in workplaces with fewer than 25 employees. This link makes it a strong dataset and provides firm level control variables not available in typical worker surveys. To reflect sampling, we use establishment weights to be representative of the population.

Each employee is asked "*Do you supervise any other employees? A supervisor, foreman or line manager is responsible for overseeing the work of other employees on a day-to-day basis*" Yes/No. Employees are also asked "*How much do you get paid for your job here, before tax and other deductions are taken out? If your pay before tax changes from week to week because of overtime, or because you work different hours each week, think about what you earn on average*". Respondents report their wage within 14 bands representing weekly income. The ranges approximate decile bands and the top and bottom 5% of the earnings distribution as estimated from the New Earnings Survey. While 14 carefully chosen bands provide substantial variation, we implement interval regression to avoid biased estimates.

We also know the respondents' usual working hours per week. To reduce participation issues, we restrict the sample to full-time employees (>=30 hours per week) aged 18-65 years although we will experiment with the treatment of hours. The critical employer size variable comes from the establishment level questionnaire and identifies the total number of workers in the establishment (matching Meagher and Wilson 2004). After dropping observations with missing data, we have 14420 workers in 1813 workplaces.

3. Methodology and Results

We estimate a maximum likelihood interval regression (Stewart 1983) of this underlying model:

$$y_{ih} = \beta_0 + \beta_1 Size_h + \beta_2 \boldsymbol{x}_{ih} + \beta_3 \boldsymbol{w}_h + \varepsilon_{ih} \qquad (1)$$

The dependent variable y_{ih} is the log-hourly pay of individual *i* in firm *h*. The estimated coefficients from the interval regression can be interpreted directly as they reflect the underlying unobserved continuous model (1). We estimate for supervisors alone and for workers alone. We also estimate a fully interacted specification that tests the statistical difference in the coefficients between workers and supervisors. Our attention is on the difference in the coefficient on *size*.

The vector of individual controls $\boldsymbol{x}_{ih}$ includes employee age and its square, tenure and its square, dummies for gender, married or cohabitating, union membership, seven educational dummies, a vocational qualification dummy, two dummies capturing a permanent or temporary job (vs. 'fixed period' job), and eight occupational dummies. Workplace controls $\boldsymbol{w}_h$ include dummies for being part of a larger organization or a single independent establishment (vs. 'sole UK establishment of a foreign organisation'), the percentages of eight occupations, the percentage female, part-time and union employees, eleven industry dummies and nine region dummies. Selected descriptive statistics are in Table 1.

Table 2 presents initial results. In all log-linear estimates we divide employer size by 10,000 to avoid very small coefficients. Thus, in column one, every 100 additional workers is associated with a .0085 increase in log wages for supervisors but only a .0046 increase for workers (Column 2). The stacked interaction estimate in Column 3 estimate shows virtually the same difference but indicates it is a significantly different from zero. In columns 4 - 6 we repeat the estimates using the natural log of employer size. Here we find that the supervisor sample takes a coefficient .064 and that for workers is statistically smaller and only .018. Interestingly, the worker estimate is identical to that found by Meagher and Wilson (2004) for Australia even as the supervisor estimate is larger than their estimate of .042.

In columns 7 to 9 we repeat the original log-linear estimates but in a more flexible framework. The dependent variable is the log of weekly earnings with the log of weekly hours moved to the right hand side as a control variable. This could be highly relevant as supervisors typically have salaries that are less responsive to increases in hours. If so, this may influence both the weekly return to hours worked and the estimated coefficient on firm size. Indeed, the coefficient on log hours is smaller for supervisors as shown but it does not dramatically alter the return to firm size which continues to be roughly twice as large for supervisors.[1]

While these different functional forms tell the same basic story, we also explore a substantial change in sample. Although establishment size effects have been observed in governmental and non-profit sectors (Belman and Heywood 1990), we now limit the sample to only those establishments trading goods in markets. The final panel of Table 1 shows an even larger difference with every additional 100 workers associated with approximately a .0135 increase in log wages for supervisors but only a .0060 increase for workers.

[1]This pattern remains in a flexible log-log specification and when expanding the sample to anyone working more than 24 hours per week.

Finally, WERS contains workers and supervisors in the same workplace. Thus, we construct an average establishment wage difference (taking mid-points) between supervisors and workers. By differencing we hope to create a dependent variable that controls for unobserved firm specific effects influencing the wages of both supervisors and workers. We include all the establishment controls and averaged differences of relevant worker controls. The lesson remains unchanged as firm size greatly increases the average difference in earnings (see Table 3). To take a dramatic example, the increased gap associated with 1000 more workers is .125 log wages holding other determinants constant. This is larger than implied by the separate estimates of supervisors and managers and represents a large share of the .303 average difference in log wages between supervisors and workers.

4. Conclusions

Our results indicate that returns to supervisory talent represent a critical component of the employer size effect. The size effect is substantially larger for supervisors. Indeed, estimates within firms show the gap between supervisor and worker pay grows dramatically with size. These results would be anticipated if superior managers earn larger returns at larger employers.

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Table 1. Selected descriptive statistics

	Supervisors		Workers	
Variable	Mean	Standard deviation	Mean	Standard deviation
Weekly earnings	717.41	647.25	424.79	319.27
Working hours per week	38.883	4.733	38.010	4.242
Number of employees	60.324	193.440	51.503	187.896
Age	41.899	11.019	39.453	12.383
Male	0.526	0.499	0.492	0.500
Married	0.719	0.449	0.650	0.477
Degree	0.187	0.390	0.170	0.376
Postgraduate	0.081	0.273	0.055	0.228
Vocational qualification	0.068	0.252	0.076	0.264
Tenure	8.680	7.324	6.756	6.871
Permanent job	0.972	0.166	0.949	0.220
Temporary job	0.006	0.077	0.021	0.145
Trade union member	0.195	0.396	0.206	0.405
Observations	5465		8955	

Notes. Estimates reflect establishment weights. Earnings are calculated using interval midpoints.

Table 2. Maximum likelihood results for Interval Regression

	LnHourlyWage			LnHourlyWage			LnWeeklyEarnings			LnHourlyWage (Trading Sector)		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	Supervisor	Worker	Diff Interact	Supervisor	Worker	Diff Interact	Supervisor	Worker	Diff Interact	Supervisor	Worker	Diff Interact
Number of employees	0.854***	0.463***	0.383**				0.818***	0.381***	0.432***	1.348***	0.596***	0.750***
	(0.173)	(0.139)	(0.167)				(0.159)	(0.122)	(0.158)	(0.338)	(0.209)	(0.272)
Log number of employees				0.064***	0.018**	0.045***						
				(0.010)	(0.007)	(0.010)						
LnHours per week							0.312***	0.551***	0.451***			
							(0.121)	(0.064)	(0.069)			
Log-likelihood	-13566.8	-21755.8	-35615.6	-13515.4	-21745.8	-35537.6	-13035.3	-20777.5	-34131.2	-7359.0	-11839.9	-19292.3
Observations	5465	8955	14420	5465	8955	14420	5465	8955	14420	3003	4940	7943

Notes. Also included are the full set of individual and establishment level controls isolated in the text. Estimates use establishment weights with standard errors clustered at the establishment level.

*** p<0.01, ** p<0.05, * p<0.1.

Table 3. OLS estimates (Dependent variable is the average log hourly wage difference between supervisors and workers at each establishment)

	Log-Linear Model	Log-Log Model
Number of employees	1.253***	
	(0.274)	
Log number of employees		0.160***
		(0.043)
R-squared	0.121	0.128
Observations	1367	1367

Notes. Estimates include the full vector of establishment controls, the average difference between supervisors and workers in age, tenure, seven educational/vocational qualifications, and the share trade union members. Estimates use establishment weights. Standard errors are clustered at the establishment level.
*** p<0.01.