The Disappearing Large Firm Wage Premium

By Nicholas Bloom, Fatih Guvenen, Benjamin S. Smith, Jae Song, and Till von Wachter*

Large firms pay higher wages than smaller firms even after controlling for the quality of a worker. While this empirical fact may seem surprising, it has been shown to hold true in many countries during most of the 20th century, going back to the first analysis of the subject by Moore (1911).[1] In this paper, we show that the large-firm wage premium (LFWP)—which we define as the gap between the average wage earnings of employees in large versus small firms (without controlling for worker characteristics)—has declined significantly since the early 1980s. The simplest illustration of this fact—and our first main result—is shown in Figure 1, which plots the LFWP in each 5-year period between a 100-employee firm (about the 25th percentile of employment-weighted firm-size distribution) to a 10,000-employee firm (about the 75th percentile). We see that the LFWP declined from 47% (i.e, average worker earnings in the latter firm size category was 47% higher than its counterpart in the former category) in the early 1980s to 20% by the early 2010s.

In the rest of the paper, we expand on this main result in several important directions. First, any discussion of the LFWP that does not address selection seriously would be incomplete. We will address two sides of the selection problem: (i) workers employed by large and small firms are likely to be different along various dimensions (e.g., skill or education, age, gender, etc.), and (ii) large and small firms themselves likely differ in various ways—in terms of industry composition, geographical regions they operate in, and so on. These points are well understood in the extant literature on the *level* of the premium, and has been addressed by using various controls.[2] Of course, similar selection issues could also be contributing to the *decline* in the LFWP *over time*.

To explore this point, we conduct several exercises. We use the fixed-effects regression framework of Abowd et al. (1999) [AKM], which allows us to estimate a separate wage fixed effect for each worker and for each firm in our sample. The worker fixed effect (or "worker quality") can be thought of as capturing both observable *and* unobservable characteristics that allow the worker to earn a high wage (controlling for the employer pay premium). The firm fixed effect is interpreted similarly as the premium a firm pays to a typical worker (i.e., quality-adjusted) relative to what the average firm pays.

During our sample period, we find that the average worker fixed effect in a firm rises with the size of the firm and can explain about 20% of the LFWP, which is consistent with a broad range of previous evidence that large firms hire higher-quality workers. A more novel finding of our paper is that about 70% of the LFWP can be explained by the fact that the firm pay premium strongly increases with firm size.

* Bloom: Stanford University, 579 Serra Mall, Stanford, CA 94305, nbloom@stanford.edu. Song: Social Security Administration, Jae.Song@ssa.gov. Guvenen: University of Minnesota, 4-101 Hanson Hall, 1925 Fourth Street South, Minneapolis, MN 55455, guvenen@umn.edu. Smith: UCLA, Bunche Hall, 315 Portola Plaza, Los Angeles, CA 90095, benssmith@ucla.edu. von Wachter: UCLA, Bunche Hall, 315 Portola Plaza, Los Angeles, CA 90095, tvwachter@econ.ucla.edu. An early version of this paper was presented at the AEA meetings in 2017. A majority of this work was performed while Ben Smith was an intern at the Social Security Administration. Special thanks to Gerald Ray at the Social Security Administration for his help and support, and Ian Schmutte for his valuable comments.

[1] Among many others, see Brown and Medoff (1989). Oi and Idson (1999) provide a thorough survey of the vast literature on the subject.

[2] Moore (1911) was keenly aware of this issue. His analysis was based on female workers in Italian textile factories categorized by age groups, which was the most detail available at the time.

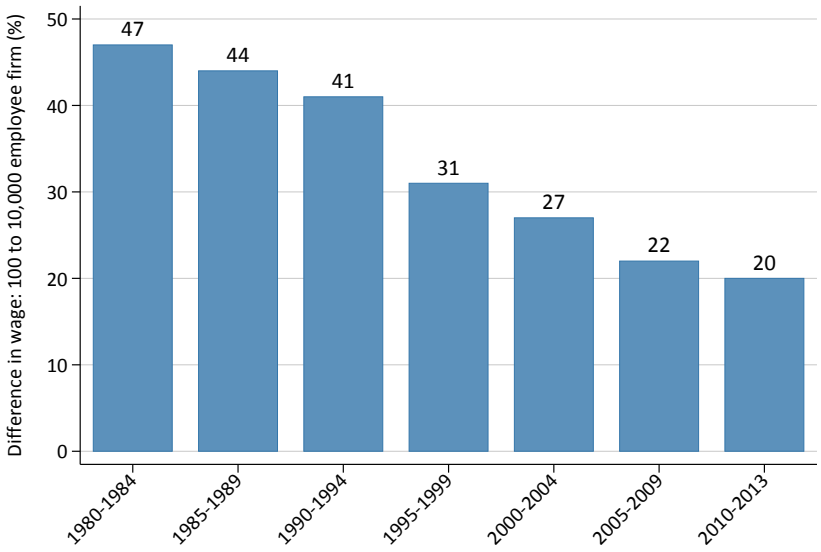


Figure 1. Difference in Average Worker Earnings: a 10,000-Employee Firm Minus a 100-Employee Firm

Turning to the change over time, we show that the reduction in the LFWP stemmed from a decline in the pay premium (or firm fixed effect) large firms were paying relative to smaller firms over this period. In contrast, we find average worker quality at larger relative to smaller firms has remained stable over time.

A third result we establish is that the decline in the LFWP was concentrated primarily among very large firms—the previously substantial LFWP between a 1,000-employee firm and a 10,000-employee firm has effectively disappeared, while the premium between a 100-employee firm and a 1,000-employee firm has only declined modestly. Again, the differential effect is almost entirely explained by a reduction in the firm pay premiums (or firm fixed effects), indicating that explanations of this decline must recognize the evolution of very large employers.

A final finding is that the bulk of the fall in the LFWP took place within industries. Although industries with a historically high LFWPs (e.g., manufacturing) shrunk while those with smaller size premiums (e.g., services and retail) expanded, the shift in industry composition can only account for about 20% of the overall decline in the premium leaving 80% of the decline within industries.

The prior literature offers several potential explanations for how firm pay premiums (i.e., firm fixed effects) could rise with firm size. One hypothesis underlying the LFWP is that larger firms may be more unpleasant to work in and hence pay compensating differentials. However, as Katz and Summers (1989) show, larger firms have a far higher number of applicants per vacancy and lower quit rates, suggesting the jobs are more desirable in general. Larger firms also have higher work-life balance and other employee satisfaction metrics (Bloom et al. 2011). This suggests that compensating differentials cannot account for the majority of the LFWP. A common alternative hypothesis has been that larger firms may earn higher rents and share some of these rents with their workers. The sharing of rents could be because of perceptions of fairness, because workers and firms bargain over the surplus, or because of the presence or threat of unions. Another explanation is that larger firms may face particular challenges in monitoring their workers, and hence pay higher wages to solve personnel problems. For example, it has long been hypothesized that large firms pay efficiency

wages (e.g., Krueger and Summers (1988)).

Studying the LFWP has importance beyond understanding the determinants of earnings. Large firms have been traditionally a source of high-quality jobs, especially for low-skilled workers. Changes in the availability of such jobs lead to a reduction in earnings among lower-skilled individuals, potentially raising the outlays for government programs that effectively insure low-income workers against lifetime earnings reductions, such as Old Age Survivor Insurance and also Social Security Disability Insurance. Since high-wage jobs are also those that are safer, have higher benefits, and have better working conditions (Maestas et al. (2017)), changes in how large firms treat workers could also impact the rate of claiming for these programs.

I. Data

We use data from the Master Earnings File (MEF), which is a confidential database compiled and maintained by the U.S. Social Security Administration (SSA). The MEF contains a separate line of record for every individual that has ever been issued a U.S. Social Security number. In addition to basic demographic information (sex, date of birth, etc.), the MEF contains labor earnings information for every year from 1978 to (as of this writing) 2013. Earnings data in the MEF are based on Box 1 of Form W-2, which is sent directly from employers to the SSA. Data from Box 1 are uncapped and include wages and salaries, bonuses, tips, exercised stock options, the dollar value of vested restricted stock units, and other sources of income deemed as remuneration for labor services by the U.S. Internal Revenue Service. The SSA MEF data are described in detail in Olsen and Hudson (2009).

II. Econometric Model

To analyze worker and firm components of earnings we follow the Card et al. (2013) implementation of the model introduced by Abowd et al. (1999). We will divide our time period into five seven-year periods and estimate a separate model for each period p. The regression model we estimate in each period is

$$y_t^{i,j} = \theta^{i,p} + X_t^i \beta^p + \psi^{j,p} + \epsilon_t^{i,j}, \quad (1)$$

where $\theta^{i,p}$ is the worker fixed effect which captures earnings differences due to fixed worker characteristics (such as returns to schooling or to innate ability) that are unobservable by the econometrician , β^p is a vector that captures the effects of time-varying and observable worker characteristics and aggregate shocks (in our case, a polynomial in age and year effects), and $\psi^{j,p}$ is the firm fixed effect which captures the wage premium firm j pays relative to other firms for the same quality-adjusted worker (which may be due to rent sharing or compensating differentials). The residual, $\epsilon_t^{i,j}$, captures transitory earnings fluctuations. We leave the dependence of the identity of the firm on the worker implicit, such that $j \equiv j(i,t)$.

We estimate equation (1) separately for five adjacent seven-year intervals beginning in 1980 and ending in 2013. Firm fixed effects are identified by workers moving between firms and hence can only be estimated relative to an omitted firm. Estimation of equation (1) is done on the largest set of firms connected by worker flows. To maximize the number of observations in the connected set, we do not impose a restriction on firm size and do not exclude the public sector.[3] Because of limitations in computing power, we estimate equation (1) for men only. As we lack data on hours or days of work, our estimates of worker and firm effects may capture systematic differences in labor supply between workers and firms. However, Song et al. (2015) show that a variance decomposition of wage components is robust across a range of labor supply sample restrictions.

III. Results

Figure (2) presents a visual representation of our main results across three different seven-year intervals. Each panel dis-

[3] Although included in the estimation, public sector jobs are excluded from the empirical analysis.

plays average log earnings in each firm size class (blue line, circles) relative to total average log earnings over the interval. Firms are assigned to eight firm size classes with the smallest firms employing at most ten workers and the largest employing over 15,000. The figure shows that the decline in the large-firm wage premium (LFWP) has not been monotone. On the one hand, the LFWP has been declining strongly at very large employers, starting at 2,500 employees. While in the 1980s going from a 1,000–2,500-employee firm (firm size group 5 in the figure) to a 10,000–15,000-employee firm (group 7) yielded about 15 log points, that gain had completely eroded by 2007–2013. At the bottom of the firm size wage distribution, on the other hand, there is still a sizable earnings premium going from a small firm (say, 10-50, group 2) to a mid-size firm (say, 1,000-2,500). That premium was approximately 35 log points in the 1980s and approximately 25 log points in the last period, with the slight decline arising from an upward shift at the bottom of the firm-size distribution. Since approximately 75% of workers in the U.S. labor market work at firms that are smaller than 2,500 employees, there is still a sizable earnings premium remaining for much of the U.S. workforce.

We also plot the average values of worker and firm earnings components estimated using the AKM estimation equation (1) – in particular the firm fixed effect (red line, triangles) and worker fixed effect (olive line, diamonds). Time-variant worker characteristics and the residual component are omitted to highlight the key forces driving the changes over time.

In terms of AKM wage components, the figure shows two key results. First, the major driver of the LFWP in earlier time periods is the firm fixed effect, which accounted for around 70% of the LFWP from 1980 to 1986. That is, the same workers appear to get paid more to work in larger firms. Another 20% of the LFWP is driven by selection effects–workers in larger firms have superior worker fixed effects. The second main finding is that the reduction in the LFWP has almost entirely been driven by the drop in the firm fixed effect premium by firm size. In particular, average earnings have fallen notably for the largest firm size group (15,000+ employees), driven almost entirely by the drop in the firm fixed effect. So, the fall in the LFWP appears to be driven by firms of 1,000 employees or more no longer paying above market salaries to their workers.

In Table (1) we formally decompose the change in the LFWP into its constituent AKM wage components. Given equation (1), log earnings is additively separable into the AKM components. Therefore, the coefficients in regressions of AKM components on log firm size mechanically add up to the total coefficient of log earnings on log firm size. The decomposition confirms the message of Figure (2). The decline in the relationship between firm fixed effects and firm size accounts for 87% of the total decline in the large firm premium. Another factor is a fall in the return to time-varying worker characteristics at large firms–contributing 20% to the total decline in the LFWP. As these characteristics include year and age effects, this result suggests that larger firms are becoming relatively younger. In contrast, selection of worker types by firm size has remained relatively stable over the period. In fact, large firms are slightly more likely to hire high-wage workers in the most recent period. This modest compositional upgrading mitigates the decline of the LFWP–accounting for an 8% increase.

In order to further understand the decline of the LFWP, we turn to an industry analysis. Table (2) presents the initial level and changes of both employment and the LFWP by nine broad industries. A few patterns are evident. First, we find a general decline in the LFWP within most industries. In fact, manufacturing is the only industry for which the LFWP did not decline. Second, we find large shifts in employment away from manufacturing, an industry with a high LFWP, into the services sector, an industry with a low LFWP. Industry codes are not assigned to new firms in the SSA data set past the year 2002, therefore, there is also a surge in employment to "unclassified" industries.

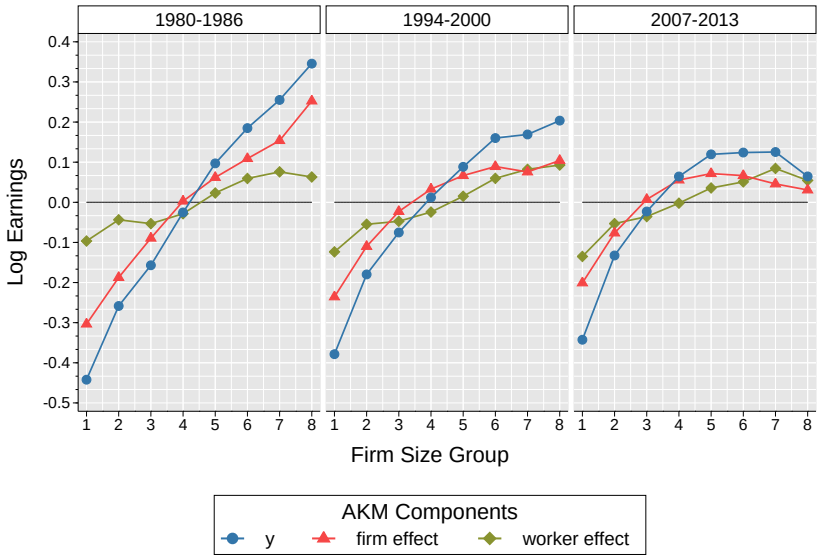


FIGURE 2. MEAN AKM COMPONENTS BY FIRM SIZE AND TIME PERIOD

Notes: Firm size groups: 1=1-10, 2=10-50, 3=50-250, 4=250-1K, 5=1-2.5K, 6=2.5-10K, 7=10-15K, 8=15K+. Age/year effects and the residual term are omitted.

Given both within-industry changes in LFWPs and large sectoral shifts in employment, we produce a decomposition to quantify the relative contributions of between- and within-industry factors on the decline in the LFWP. Our main result is that within-industry changes in the LFWP can account for 80% of the decline whereas between-industry factors account for only 20%. (Details of our analysis are in the online appendix). Therefore, the declining LFWP is not merely a reflection of sectoral employment shifts, but suggests broad changes in the pay policies of large firms throughout the economy.

IV. Conclusion

Large firms have paid a significantly higher wage for more than a century, but over the last thirty years this large-firm wage premium has started to decline. We first document that this reduction is due to a collapse of the wage gradient at very large firms, while the firm size gradient has remained stable for firms with less than 1000–2500 employees. We then show that the decline is largely due a reduction in wage premiums (firm fixed effects) at very large firms, holding worker composition constant. Furthermore the decline cannot be explained by sectoral changes in employment as the majority of the change occurs within industries.

REFERENCES

Abowd, John M, Francis Kramarz, and David N Margolis, "High Wage Workers and High Wage Firms," *Econometrica*, 1999, *67* (2), 251–333.

Bloom, Nick, Tobias Kretschmer, and John Van Reenen, "Are Family-Friendly Workplace Practices a Valuable Firm Resource?," *Strategic Management Journal*, 2011, *32* (4), 343–367.

Brown, Charles and James Medoff, "The Employer Size-Wage Effect," *Journal of Political Economy*, 1989, *97* (5), 1027–1059.

Card, David, Jorg Heining, and Patrick Kline, "Workplace Heterogeneity and the Rise of West German Wage

	Dependent Variable:				
	Log Earnings (1)	Worker Effect (2)	Firm Effect (3)	Age Effect (4)	AKM Residual (5)
Interval 1: 1980-86	0.080	0.016	0.057	0.007	0.001
Interval 5: 2007-13	0.039	0.019	0.021	-0.002	0.001
Change	-0.041	0.003	-0.036	-0.008	0.000
Share (Percent)	-	(-7.5)	(86.8)	(20.2)	(0.5)

Table 1—Change in LFWP Regression Coefficients by AKM Components

	Large Firm Premium 1980-86 (1)	Change in Large Firm Premium (2)	Employment 1980-1986 (millions) (3)	Change in Employment (millions) (4)
Manufacturing	0.094	0.003	85.9	-37.1
Mining	0.104	-0.004	5.6	-2.9
Transportation	0.096	-0.046	26.4	-1.9
Construction	0.095	-0.015	26.0	-1.8
Agriculture	0.049	-0.014	7.1	-1.0
Wholesale Trade	0.060	-0.008	19.7	-0.3
Retail Trade	0.044	-0.051	34.1	2.7
Finance & Insurance	0.057	-0.024	16.5	4.6
Services	0.054	-0.044	53.4	55.3
Unclassified	0.110	-0.048	11.2	79.8

Table 2—Change in LFWP and Employment by Industry

Inequality," *The Quarterly Journal of Economics*, 2013.

Katz, Lawrence F and Lawrence H Summers, "Industry rents: Evidence and implications," *Brookings Papers on Economic Activity. Microeconomics*, 1989, *1989*, 209–290.

Krueger, Alan B and Lawrence H Summers, "Efficiency Wages and the Inter-Industry Wage Structure," *Econometrica: Journal of the Econometric Society*, 1988, pp. 259–293.

Maestas, Nicole, Kathleen J Mullen, David Powell, Till von Wachter, and Jeffrey B Wenger, "Working Conditions in the United States," 2017.

Moore, Henry L., *Laws of wages: An essay in statistical economics*, New York: The Macmillan Company, 1911.

Oi, Walter Y. and Todd L. Idson, "Firm Size and Wages," *Handbook of Labor Economics*, 1999, *3, Part B*, 2165 – 2214.

Olsen, Anya and Russell Hudson, "Social Security Administration's Master Earnings File: Background Information," *Social Security Bulletin*, 2009, *69* (3), 29.

Song, Jae, David J. Price, Fatih Guvenen, Nicholas Bloom, and Till von Wachter, "Firming Up Inequality," Working Paper 21199, National Bureau of Economic Research May 2015.