

Variable Pay and Risk Sharing Between Firms and Workers

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Why do firms use variable-based compensation?

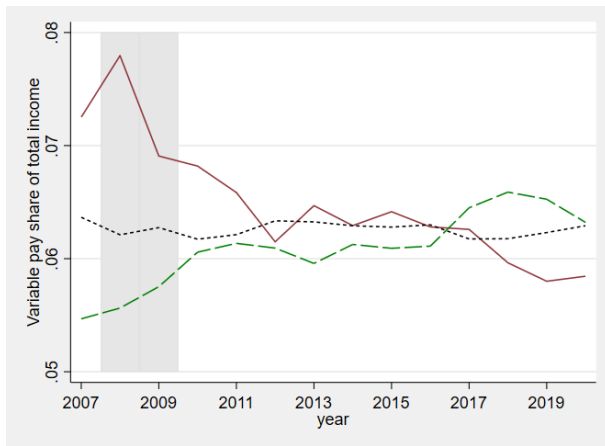
- Increase worker productivity [Lazear 2000]
- Moral hazard concerns [Holmstrom 1982]
- Delay labor bill payments
 - Elongate tenure till worker earns their bonus

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- Increase worker productivity [Lazear 2000]
- Moral hazard concerns [Holmstrom 1982]
- Delay labor bill payments
 - Elongate tenure till worker earns their bonus
- Risk-sharing mechanism [Shimer 2004]
 - **Transmit shocks to workers**

Further Motivation: The Great Recession

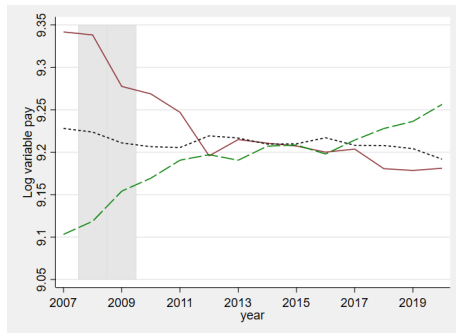
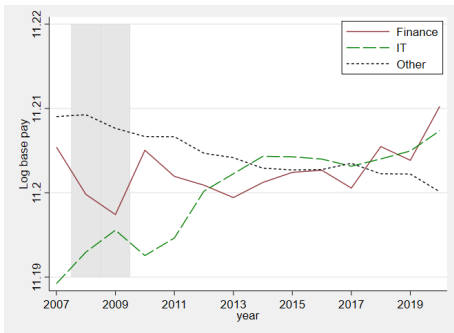
Figure: Variable Pay Share of Total Pay



After Great Recession, Finance industry became less reliant on variable pay, where as IT became more reliant.

Further Motivation: The Great Recession Continued

Figure: Log Base Pay (left) and Log Variable Pay (right)



Reflecting large movements in variable pay, not base pay.

Main Takeaways

Using compensation data from the website Glassdoor,

- 1 Document that base pay appears unaffected while variable pay acts as a transmission mechanism to pass shocks to workers
 - Regional labor market fluctuations
 - Shocks to financial performance and borrowing conditions

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 - more variance in workers' wages
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- ② Greater use of variable pay tied to
 - more variance in workers' wages
 - reduced volatility and higher mean of firm-level growth rates
- ③ Rationalize use of variable pay as risk sharing mechanism
 - contracting with limited commitment and risk-averse principal

Related Literature

① Wage Cyclicalities related to variable earnings

- Devereux (2001), Lemieux et al. (2012), Makridis and Gittleman (2017), Grigsby et al. (2019)

Contribution: We analyze variable-based earnings directly and show it transmits unemployment and firm performance shocks

② Firm characteristics, performance, and outcomes

- e.g., Currie and McConnell (1992), Guiso et al. (2005), Benmelech et al. (2012), Carlsson et al. (2019), Friedrich et al. (2019), Balke and Lamadon (2019), DiMaggio et al. (2020), Kogan et al. (2020)

Contribution: We show variable pay reflects firm performance, assets, profitability, and its usage relates to firm-level outcomes.

③ Optimal contracting under limited commitment

- Thomas and Worrall (1988), Kehoe and Levine (1993), Kocherlakota (1996), Alvarez and Jermann (2000), Grochulski and Zhang (2011), Xiaolan (2014), Miao and Zhang (2015), Ai and Bhandari (2021)

Contribution: We model a risk-averse principal to explain variable pay as risk sharing of transient shocks

The Dataset (Glassdoor)

- ① 3.3 million earnings reports for U.S. workers from 2007–2020
 - Sample restricted to full-time, salaried, private-sector
- ② Each worker reports base and variable earnings separately
 - Cash bonuses, stock bonuses, profit sharing, sales commissions
 - Measures reflect annualized earnings
- ③ Observables: firm, job title, location, experience, gender
 - Job titles allow us to control for similarly productive workers [Marinescu and Wolthoff 2020, Sockin and Sockin 2019]
- ④ With employer names, link to Compustat data for public firms
 - Annual financial performance, growth rates
- ⑤ External validity: within industry and region [Kabarounis and Pinto 2019], occupation [Gibson 2021], college [Martellini et al. 2021]

Summary Statistics for Main Dependent Variables

	Log base pay	Log variable pay	1(Earns VP)	VP share total pay	Conditional VP share total pay
<i>Panel A: Full sample</i>					
Observations	3,141,032	1,251,369	3,332,004	3,141,032	1,251,369
Mean	80,842	21,983	0.432	0.060	0.152
Median	70,507	10,244	0.000	0.000	0.100
Standard deviation	41,673	36,905	0.495	0.117	0.144
<i>Panel B: Compustat financial performance sub-sample</i>					
Observations	1,170,613	578,937	1,244,718	1,170,613	578,937
Mean	89,199	24,744	0.524	0.078	0.158
Median	80,379	11,654	1.000	0.000	0.111
Standard deviation	43,016	39,189	0.499	0.124	0.137

- 43.2% of sample earns variable pay (52.4% for public firms)
- Average variable pay ~\$22–25k, twice as large as median
- 6.0% of total compensation reflects variable pay
 - Rises to 15.2% for workers who receive variable pay

Empirical Analyses

- ① **Regional labor markets**
- ② Firm financial performance
- ③ Variance of workers' earnings
- ④ Firm-level growth rates

Procyclical Variable Pay, Acyclical Base Pay

For worker i with job title j at firm k within industry $\iota(k)$ employed in MSA m in year t ,

$$Y_{ijkmt} = \beta \times \text{mean}(UR_{m,t-1}, UR_{m,t}) + \gamma X_{it} + \lambda_{jk} + \lambda_m + \lambda_{\iota(k)t} + \epsilon_{ijkmt}$$

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	Log base pay			Log total pay		1(Earns VP)	Log VP	VP share total pay
	Full sample	Does not earn VP	Earns VP	Full sample	Earns VP			
Metro UR	-0.239 (0.168)	-0.209 (0.149)	-0.175 (0.186)	-0.430* (0.245)	-0.461 (0.333)	-0.501*** (0.169)	-2.062** (1.008)	-0.147** (0.064)
Mean DV	1120.48	1109.81	1134.08	1128.83	1153.63	47.30	929.67	6.85
N	1972719	1024341	787975	1972719	787975	2112446	787975	1972719
Adjusted R ²	0.84	0.82	0.87	0.82	0.83	0.30	0.69	0.48

- Base pay for salaried workers appears acyclical.
- Variable pay, both incidence and magnitude, procyclical.
- Total compensation becomes more intensive in variable pay as labor market conditions improve.

Regional Labor Market Tightness, Firm Heterogeneity

	Log BP	Log VP	1(Earns VP)	VP share total pay
<i>Panel A: Small vs. large</i>				
Metro UR x small firm	-0.237*** (0.056)	0.251 (0.290)	-0.048 (0.062)	0.006 (0.020)
<i>Panel B: Local vs. national</i>				
Metro UR x local firm	-0.349*** (0.048)	0.273 (0.428)	-0.154* (0.084)	-0.001 (0.027)
<i>Panel C: Young vs. older</i>				
Metro UR x young firm	-0.181*** (0.067)	-0.292 (0.462)	-0.225 (0.174)	-0.055* (0.033)
<i>Panel D: Nontraded vs. traded</i>				
Metro UR x nontraded industry	-0.131 (0.145)	0.133 (0.535)	0.137 (0.136)	0.025 (0.042)
<i>Panel E: Public vs. private</i>				
Metro UR x private	-0.186*** (0.064)	-0.258 (0.259)	-0.278*** (0.086)	-0.006 (0.016)
<i>Panel F: Less vs. more concentrated market</i>				
Metro UR x less concentrated market	-0.044 (0.037)	-0.199 (0.170)	0.023 (0.058)	-0.013 (0.010)

- Incidence and magnitude of variable pay procyclical across all firm partitions
- For firms more likely constrained by labor market tightness, base pay procyclical
 - Smaller, younger, private, local firms

Empirical Analyses

- 1 Regional labor markets
- 2 **Firm financial performance**
- 3 Variance of workers' wages
- 4 Firm-level growth

Gauging Firm Performance from Public Firms in Compustat

Map employers in Glassdoor to a GVKEY identifier in Compustat.

Obtain annual measures of firm financials

- Performance: EBITDA, sales-to-employment, earnings per share
- Characteristics: assets, leverage, Tobin's Q

Z-score each measure within each calendar year, and assign prior year's performance to current year's earnings.

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Relate firm performance to worker pay:

$$Y_{ijkmt} = \beta J_{kt-1} + \gamma X_{it} + \lambda_{jk} + \lambda_{l(k)t} + \lambda_{mt} + \epsilon_{ijkmt}$$

β interpreted as the effect on pay from a one-standard deviation increase in performance the previous year, relative to the firm's average level of performance and the annual growth across the firm's industry, for workers with the same job title within the firm

Shocks to Firm Financial Performance Affect Variable Pay

Standardized z-score	Log BP	Log VP	1(Earns VP)
EBITDA	-0.620* (0.375)	5.626** (2.327)	-0.261 (0.863)
Average earnings per share	0.045 (0.122)	0.618 (0.659)	0.568** (0.259)
Stock return	0.040 (0.055)	1.359*** (0.310)	0.585*** (0.139)
Log sales-to-lagged-assets ratio	0.467 (0.310)	3.469** (1.559)	1.601*** (0.615)
Log sales-to-employment ratio	0.709 (0.496)	5.934** (2.576)	4.012*** (1.143)
Log assets	1.507 (1.081)	12.744*** (4.907)	-1.476 (1.982)
Log leverage ratio	-0.510** (0.202)	-0.192 (1.127)	-0.494 (0.352)
Log Tobin's Q	-0.130 (0.270)	6.357*** (1.133)	0.753* (0.397)

- Base pay unmoved by deviations to firm performance
- Variable pay, both incidence and magnitude, reacts to performance
 - Jumps in sales-related and financially-related measures pass on to variable pay
 - Growth in assets and profitability also passes through variable pay

Moody's Credit Ratings: Investment Grade vs. Junk

Investment grade have lower borrowing costs than junk grade [Tang 2009].

- Speculative grade (Baa3-Aaa) vs. junk grade (Ca-Ba1)

Firms can switch between investment and junk grade each year

- Consider ± 3 years around each switch
- 96 such switching events with sample coverage pre and post

Create a new sample s for each event and estimate stacked differences in differences regression [Cengiz et al. 2019]

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Relate borrowing conditions to worker pay:

$$Y_{ijkmts} = \beta \text{InvestmentGrade}_{kt} + \gamma X_{it} + \lambda_{jk} + \lambda_{mt} + \lambda_{\ell(k)t} + \lambda_s + \epsilon_{ijkmts}$$

β : the effect on average pay for workers with the same job title in the firm from the firm having an investment grade credit rating.

Shocks to Borrowing Conditions Affect Variable Pay

$$Y_{ijkmts} = \beta \text{InvestmentGrade}_{kt} + \gamma X_{it} + \lambda_{jk} + \lambda_{mt} + \lambda_{l(k)t} + \lambda_s + \epsilon_{ijkmts}$$

	Log BP	Log VP	1(Earns VP)	VP share total pay	Conditional VP share total pay
1(Investment grade)	0.015*** (0.004)	0.084*** (0.026)	0.009 (0.014)	0.004** (0.002)	0.007*** (0.002)

- Base and variable pay fall when firm credit rating drops from investment to speculative grade
- Variable pay more responsive (but not incidence)
- Total compensation becomes more intensive in variable pay as borrowing conditions improve.

Empirical Analyses

- ① Regional labor markets
- ② Firm financial performance
- ③ **Variance of workers' wages**
- ④ Firm-level growth

Relate Wage Variance to Firm-Level Variable Pay Intensity

Compute variance of workers' total earnings for the firm: V_k

- First residualize wages by worker and firm observables
- Calculate variance of residuals for each firm k

Compute variable pay intensity for the firm: \widetilde{VP}_k

- First residualize VP incidence by worker and firm observables
- Calculate mean residual for each firm k

Relate wage variance within the firm to firms' VP usage:

$$V_k = \beta \widetilde{VP}_k + \text{firm observables} + \epsilon_k$$

Variance of Workers' Earnings Rises with Variable Pay Use

	Variance of log total pay	
Share earns VP	0.050*** (0.004)	
VP share total pay		0.552*** (0.024)
Mean DV	0.135	0.135
Std. dev. DV	0.120	0.120
N (firms)	64758	64758

Note: Variance calculated after first residualizing total pay by experience, gender, industry, metropolitan area, and year.

- Consistent with our model, workers employed at firms that use variable pay more intensely face more earnings dispersion
- 1 p.p. increase in VP share of total pay associated with 0.05 standard deviations greater earnings variance

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Volatility in Sales, Employment, Productivity Growth

Methodology of Comin and Philippon (2005) and Davis et al. (2006):

Growth rate of measure m for firm k in year t :

$$g_{kt}^m = \frac{m_{kt} - m_{kt-1}}{(m_{kt} + m_{kt-1})/2}$$

Then, the volatility of measure m for firm k is given by:

$$\nu_k^m = \left[\sum_t \left(\frac{\hat{z}_{kt}^m}{P_k^m - 1} \right) (g_{kt}^m - \bar{g}_k^m)^2 \right]^{\frac{1}{2}}$$

where: $z_{kt}^m = (m_{kt} - m_{kt-1})/2$ and $P_k^m = \sum_t \mathbb{1}\{z_{kt}^m > 0\}$,

$$\bar{g}_k^m = \sum_t z_{kt}^m g_{kt}^m / P_k^m \quad \text{and} \quad \hat{z}_{kt}^m = z_{kt}^m \times (P_k^m / \sum_t z_{kt}^m)$$

Relate volatility to VP usage: $\nu_k^m = \beta \widetilde{VP}_k + \text{firm observables} + \epsilon_k$

Volatility of Annual Growth Rates 2011-2020

	Sales volatility	Employment volatility	Productivity volatility
Share earns VP	-0.037* (0.019)	-0.033*** (0.011)	-0.030 (0.024)
Share earns cash bonus	-0.017 (0.014)	-0.019** (0.008)	-0.000 (0.013)
Share earns stock bonus	-0.002 (0.035)	0.023 (0.020)	-0.010 (0.028)
Share earns profit sharing	-0.071** (0.032)	-0.117*** (0.014)	-0.086** (0.032)
Share earns sales commission	-0.123** (0.044)	-0.065** (0.029)	-0.127** (0.051)
VP share total pay	-0.237 (0.170)	-0.148** (0.061)	-0.183 (0.179)

- Firms that use VP more intensely experience less volatility.
 - 10 p.p. increase in the share of workers earning VP associated with 0.03–0.04 standard deviations lower employment volatility
- Driven by cash, sales commissions and profit sharing.

Mean Annual Growth Rates 2011-2020

	Sales growth	Employment growth	Productivity growth
Share earns VP	0.036*** (0.010)	0.028*** (0.008)	0.007 (0.007)
Share earns cash bonus	0.009 (0.008)	0.007 (0.010)	0.000 (0.007)
Share earns stock bonus	0.135*** (0.023)	0.098*** (0.032)	0.036** (0.013)
Share earns profit sharing	-0.017 (0.012)	-0.007 (0.015)	-0.004 (0.014)
Share earns sales commission	0.033 (0.027)	-0.004 (0.020)	0.046*** (0.013)
VP share total pay	0.285*** (0.084)	0.195* (0.093)	0.101*** (0.034)

- Firms using VP enjoy faster sales and employment growth
 - Driven by stock bonuses.
- More VP intensity associated with faster productivity growth
 - Driven by sales commissions and stock bonuses.

Implications for Theories of Wages

- Our results can inform our understanding of how wages are set
- Shock transmission to wages consistent with
 - risk sharing between firms and workers
 - a concern for equity [Bewley 1995]
- Difficult to reconcile with...
 - employers insulating workers from risk [e.g., Baily 1974, Harris and Holmstrom 1982, Thomas and Worrall 1988]
 - rank-and-file incentives from moral hazard [e.g., Holmstrom 1982]
 - wage setting in monopsonistic labor markets

A Conceptual Framework

- Risk averse firm hires a single worker to produce output
 - effectively risk averse [e.g., Greenwald and Stiglitz 1990, Bolton et al. 2011, Papanikolaou and Panousi 2012]
- Worker pay responds to shocks to firm performance and labor market conditions
 - Base pay affected when outside option binds
 - Variable pay affected when not binding
- Effect concentrated in employers likely to be more effectively risk averse, or struggle to hire in tighter labor markets
 - i.e., financial frictions, liquidity constraints, firm reputation
 - Test with younger, smaller, private, and local firms
- Variance of worker compensation higher
- Volatility of employment lower

Concluding Remarks

- Variable earnings a conduit for shocks and firm performance
- Variable pay incidence and magnitude highly procyclical
- Risk sharing between firms and workers may explain why firms use variable pay
 - Reduced volatility of growth (cash, profit sharing, commissions)
 - Possibly faster rates of growth (stock)
- Further work needed to understand,
 - why firms offer different types of variable pay?
 - why firms use variable pay to varying degrees?