

# Inequality at Work: The Effect of Peer Salaries on Job Satisfaction

David Card  
Alexandre Mas  
Enrico Moretti  
Emmanuel Saez

## Motivation

Old idea in economics: people care about absolute and relative income e.g.: Veblen (1899), Duesenberry (1949),...

Relative income ideas enjoyed a surge of interest in the 1970s (Easterlin, 1974; Hamermesh, 1975; Boskin and Sheshinski, 1978). Re-surfaced in the 1990s with Akerlof and Yellen (1990); Marmot (“Whitehall” Studies), happiness work (Layard, Oswald,...).

## Evidence?

- Cross sectional correlations show some support for relative pay effects (Clark and Oswald 1996)
- Whitehall studies show relationship with health
- Lab studies (Fehr et al) – some evidence
- Firms appear to think relative income concerns are important (Bewley). People “acting as firms” incorporate these concerns (Charness and Kuhn, 2007)
- Firm secrecy policies

## Our idea

Take advantage of a “new” source of co-worker pay

–Sacramento Bee website, est. 2008

–Easily look up pay of all state workers

Step 1: Randomly inform some people about the site

Step 2: survey “treated” and “untreated” and compare responses

Randomized information treatment as an alternative to direct manipulation of peer salaries

## Conceptual Framework

Direct relative income concerns with limited information

$I$ =agent's information set

$m$ =reference level which is a function of peer wages

Job satisfaction ( $S$ ) depends on  $w$  and  $m$

$$S(w,I) = u(w) + v( w - E[ m | I ] ) + e$$

Absence of site:  $E[ m | I^0 ] = w$

With site:  $E[ m | I^1 ] = m$

$D$  = indicator for informed status. So:

$$S(w,I,D) = u(w) + D \cdot v( w - m ) + e$$

## Model continued

a) Linear comparison function:  $v(w - m) = b(w - m)$

$$S(w,m,D) = u(w) + b \cdot D \cdot (w - m) + e$$

### *Implications:*

i) Information raises  $S$  if  $w > m$ , lowers if  $w < m$

ii) average effect is 0

iii) Treatment response is linear

$$R = E[S | w, m, D=1] - E[S | w, m, D=0] = b(w - m)$$

Note: To estimate  $R$  we will assume  $m$  is the median wage in the reference group as the baseline assumption.

## Model continued

b)  $v(\cdot)$  concave- as assumed by Fehr-Schmidt paper on inequality aversion (and others):

$$v(w - m) = b_0 (w - m) \cdot (w \leq m) + b_1 (w - m) \cdot (w > m)$$

$$\text{with } b_0 > b_1 \geq 0$$

$$S(w, m, D) = u(w) + b_0 D (w - m) \cdot (w \leq m) \\ + b_1 D (w - m) \cdot (w > m) + e$$

*Implications:*

- i) Treatment lowers  $S$  if  $w < m$
- ii) Treatment raises  $S$  if  $w > m$  and  $b_1 > 0$
- iii) Average effect is negative
- iv) Treatment response is kinked at  $w = m$

## Implementation Issues

General model:  $S = u(w) + D \cdot v(w-m) + e$

Incomplete compliance:

We control  $T$ , not  $D$ .

$$\pi_0 = E[D \mid T=0, w, m] \sim 0.20$$

$$\pi_1 = E[D \mid T=1, w, m] \sim 0.50$$

$$S(w, m, T) = u(w) + \pi_0 v(w-m) + \\ T \cdot (\pi_1 - \pi_0) v(w-m) + e + \Phi$$

$\Phi$  is mean 0, orthogonal to  $w, m, T$

# Design of Experiment

- SacBee site was initiated spring 2008
- We decided to try to conduct a randomized information experiment. Started in fall 2008 at UCSC and UCSD, final surveys of UCLA in spring 2009
- Data sources:
  - Email directories (scraped from web)
  - Complete salary data (from UC, same source as SacBee)
  - 1<sup>st</sup> stage “information treatment” survey
  - Follow-up survey

Must enter last name or select agency or university...

First Name

Last Name

Agency or University -- Any --

Base Salary -- Any --

Job Title

# State Salaries Results

Please give results up to one minute to load ...

First Name	JEFF
Last Name	TEDFORD
Agency or University	UC BERKELEY
Job Title	HEAD COACH-INTERCOLG ATHLETICS
Base Pay	\$225,000.00
Overtime	\$0.00
Gross Pay	\$2,831,653.50

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**Appendix Table A0: Design of the Information Experiment**

Campus	Information Treatment Assignment	Response Incentive Assignment
<u>UC Santa Cruz</u> N=3,606 in 223 departments or administrative units	66.7% of departments assigned  60% of individuals in treated department assigned	33% of departments assigned to 100% incentive (all receive incentive) 33% of departments assigned to 50% incentive (one-half receive incentive) 33% of departments assigned to no
<u>UC San Diego</u> N=17,857 in 410 departments or administrative units	50% of departments assigned  50% of individuals in treated department assigned	33% of departments assigned to 100% incentive (all receive incentive) 33% of departments assigned to 50% incentive (one-half receive incentive) 33% of departments assigned to no incentive (none receive incentive)
<u>UCLA</u> N=20,512 in 445 departments or administrative units	50% of departments assigned  75% of individuals in treated department assigned	All individuals receive incentive
<u>All Three campuses</u> N=41,975 in 1,078 departments or administrative units		

## **Appendix Table A0 (continued): Placebo Treatment at UCLA only**

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Campus	Placebo Assignment
<u>UCLA</u> N=20,512 in 445 departments or administrative units	25% of departments assigned  75% of individuals in placebo department assigned

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# First stage email

“We are Professors of Economics at Princeton University and Cal Berkeley conducting a research project on pay inequality at the University of California. The Sacramento Bee newspaper has launched a web site listing the salaries for all State of California employees, including UC employees. The website is located at [www.sacbee.com/statepay](http://www.sacbee.com/statepay) or can be found by searching “Sacramento Bee salary database” with Google. As part of our research project, we wanted to ask you: Did you know about the Sacramento Bee salary database website?”

# Second stage survey questions

1. How satisfied are you with your wage/salary on this job?  
[0-3]

2. How satisfied are you with your job? [0-3]

3. Do you agree or disagree that your wage is set fairly in relation to others in your department/unit? [0-3]

4. How likely is it you will make a genuine effort to find a new job within the next year? [0-2]

5. Are differences in income in American too large? [0-3]

1-3 combined into an overall 10 point scale "Satisfaction Index" [for simplicity and precision]

1-4 combined into a 0-1 "Dissatisfied and likely looking for new job"

**Table 2: Comparison of Treated and Non-treated Individuals**

	Mean of Control Group <sup>a</sup>	Mean of Treatment Group	Difference (adjusted fo campus)	t-test
	(1)	(2)	(3)	(4)
<u>Overall Sample (N=41,975)</u>				
Percent faculty	16.2	19.1	1.47 (1.61)	0.91
<u>Sample Matched to Wage Data (N=31,887)</u>				
Mean total earnings (base + supplements, \$1000's)	63.35	66.93	2.34 (1.91)	1.22
Percent responded to survey with non-missing responses for 8 key variables	21.1	17.8	-2.76 (0.61)	4.49
<u>Survey Respondents with Wage Data and non- Missing Values (N=6,411)</u>				
Percent faculty	15.0	17.9	1.22 (1.79)	0.68
Mean total earnings (\$1000's)	65.61	69.09	1.69 (2.23)	0.75
Percent female	60.9	61.0	0.43 (1.79)	0.24
Percent age 35 or older	72.9	75.9	1.68 (1.46)	1.15
Percent employed at UC 6 years or more	59.1	62.7	1.03 (1.67)	0.62
Percent in current position 6 years or more	40.3	43.8	1.76 (1.63)	1.08

**Table 3: Effect of Treatment on Use of Sacramento Bee Website**

	(1)	(3)	(4)	(5)
Treated individual (coefficient $\times$ 100)	28.3 (1.6)	28.5 (1.6)	--	28.3 (2.0)
Treated individual with wage less than median in pay unit (coefficient $\times$ 100)	--	--	29.3 (2.1)	--
Treated individual with wage greater than median in pay unit (coefficient $\times$ 100)	--	--	27.7 (2.0)	--
Treated individual $\times$ deviation of wage from median in pay unit (coefficient $\times$ 100)	--	--	--	-0.4 (0.7)
Treated individual $\times$ deviation of wage from median in pay unit if deviation positive (coefficient $\times$ 100)	--	--	--	0.3 (0.9)
Dummy for wage less than median in pay unit (coefficient $\times$ 100)	--	--	-1.6 (1.8)	--
Deviation of wage from median (coefficient $\times$ 100)	--	--	--	-0.1 (0.40)
Deviation of wage from median if deviation positive (coefficient $\times$ 100)	--	--	--	0.4 (0.50)
Demographic controls (gender, age, tenure and time in position)	no	yes	yes	yes

**Appendix Table A2: Treatment Effects on Use of Sacramento Bee Website for Different Types of Salary Information**

	Used Sacramento Bee Website and Looked at Salary Information for:					
	Use Sacramento Bee website	Colleagues in own department	Colleagues in other departments, own campus	Colleagues at other UC campuses	"High-profile" UC employees	Any of those in cols. 2-5
	(1)	(2)	(3)	(4)	(5)	(6)
Mean rate of use for control group (percent)	24.3	15.2	10.1	6.4	13.2	23.9
<i>Estimated treatment effect from model with basic controls:</i>						
Treated individual (coefficient × 100)	27.8 (2.4)	24.1 (2.2)	15.0 (1.7)	7.5 (1.4)	9.5 (2.0)	27.6 (2.4)
<i>Estimated treatment effect from interacted model with basic controls:</i>						
Treated individual with wage less than median in pay unit (coefficient × 100)	29.5 (3.5)	25.4 (3.3)	14.5 (2.3)	7.6 (2.0)	10.6 (2.9)	29.4 (3.5)
Treated individual with wage greater than median in pay unit (coefficient × 100)	26.3 (2.8)	23.0 (2.7)	15.6 (2.1)	7.4 (1.7)	8.7 (2.4)	26.1 (2.8)
P-value for equality of treatment effects <sup>a</sup>	0.45	0.54	0.72	0.92	0.56	0.41

## First stage findings

- Informing workers about the website has a large impact on information on peers' salary: Treatment more than doubles the rate of use from 20% to 50%
- Effect on rate of use is uniform across pay groups  $\Rightarrow \pi_1 - \pi_0$  constant seems to hold so we can identify effects by pay level
- Most new users (80%) report that they investigated colleagues in their own department/unit  $\Rightarrow$  Dept seems relevant pay unit  $\Rightarrow$  We define pay unit = Department x (faculty/staff)
- No spillover of treatment within departments

## Outcome measures

- Focus on three measures:
  - Satisfaction index (1-10 scale) =Average of wage satisfaction, job satisfaction, and fairness of wage
  - Response to search intentions (1 = “Very likely to search”)
  - Variable for satisfaction index <median and respondent is very likely to search (0-1 scale)

## Second stage specifications

$$S = g(w, x) + b \cdot T + e$$

$$S = g(w, x) + a \cdot 1(w \leq m) + b_0 \cdot T \cdot 1(w \leq m) + b_1 \cdot T \cdot 1(w > m) + e$$

$$S = g(w, x) + b_0 \cdot T \cdot (w - m) \cdot 1(w \leq m) + b_1 \cdot T \cdot (w - m) \cdot 1(w > m) + e$$

$$S = g + b_0 \cdot T \cdot [\text{rank}(w) - .5] \cdot 1(w \leq m) + b_1 \cdot T \cdot [\text{rank}(w) - .5] \cdot 1(w > m) + e$$

We always include controls for campus  $\times$  (faculty/staff) and cubic in  $w$

We sometimes add demographic controls  $x$  (gender, age, tenure)

We always cluster s.e. by pay unit = dept  $\times$  (faculty/staff)

**Table 4: Effect of Information Treatment on Measures of Job Satisfaction**

	Satisfaction Index (10 point scale)		Reports Very likely to Look for (Yes = 1)		Dissatisfied and Likely Looking (Yes = 1)	
	(1)	(2)	(4)	(5)	(7)	(8)
	Treated individual	-2.0 (2.2)	--	1.0 (1.2)	--	2.0 (1.1)
I. Treated individual with earnings $\leq$ median pay in unit	--	-6.3 (2.9)	--	4.3 (1.8)	--	5.2 (1.8)
II. Treated individual with earnings $>$ median pay in unit	--	2.0 (2.6)	--	-2.0 (1.6)	--	-0.9 (1.3)
II-I	--	8.3 (3.5)	--	-6.3 (2.4)	--	-6.1 (2.1)
P-value for exclusion of treatment effects	0.36	0.05	0.85	0.03	0.08	0.01
Mean of the dependent variable in the control group [standard deviation]	274.2 [66.1]		21.9 [41.4]		12.9 [33.5]	

**Table 4: Effect of Information Treatment on Measures of Job Satisfaction (cont.)**

	<u>Satisfaction Index</u> <u>(10 point scale)</u>	<u>Reports Very likely to</u> <u>Look for New Job</u> <u>(Yes = 1)</u>	<u>Dissatisfied and Likely</u> <u>Looking for a New Job</u> <u>(Yes = 1)</u>
	(3)	(6)	(9)
Treated individual with earnings > median pay in unit	2.2 (2.6)	-2.0 (1.6)	-0.9 (1.3)
Treated × earnings in first quartile in pay unit	-15.0 (4.0)	8.0 (2.6)	8.1 (2.4)
Treated × earnings in second quartile in pay unit	1.9 (3.9)	0.8 (2.5)	2.5 (2.3)
P-value for exclusion of treatment effects	0.00	0.01	0.00

**Table 5: Effect of Information Treatment on Measures of Job Satisfaction: Earnings Differences vs. Rank**

	Satisfaction Index (10 point scale)			Reports Very likely to Look for New Job (Yes = 1)			Dissatisfied and Likely Looking for a New Job (Yes = 1)		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Treated individual × deviation of wage from median if deviation negative (coefficient × 100)	1.7 (0.9)	--	-0.8 (1.5)	-1.4 (0.5)	--	-0.1 (0.9)	-1.3 (0.5)	--
Treated individual × deviation of wage from median if deviation positive (coefficient × 100)	-0.5 (0.6)	--	-0.8 (0.9)	-0.5 (0.3)	--	-0.5 (0.4)	-0.2 (0.2)	--	-0.1 (0.3)
Treated individual × deviation of rank from 0.5 if deviation negative (coefficient × 10)	--	2.4 (1.0)	3.3 (1.8)	--	-1.9 (0.7)	-1.7 (1.1)	--	-1.8 (0.6)	-2.0 (1.0)
Treated individual × deviation of rank from 0.5 if deviation positive (coefficient × 10)	--	-0.3 (0.9)	0.8 (1.5)	--	-0.8 (0.5)	-0.1 (0.8)	--	-0.4 (0.4)	-0.2 (0.7)
Controls for campus × (staff/faculty) and cubic in wage?	yes	yes	yes	yes	yes	yes	yes	yes	yes
P-value for exclusion of treatment effects	0.12	0.06	0.07	0.01	0.01	0.03	0.02	0.01	0.03

## Second stage findings

- Information has slightly negative effect on overall satisfaction
- Average masks strong heterogeneous effects: (a) Treatment reduces job satisfaction and increases job search intentions for workers below median, (b) no significant changes for workers above median
- Effects are large and concentrated among employees in first quartile of pay unit
- Rank relative to median seems to matter more than pay gap relative to median
- Results support relative income model based on rank (Parducci '95) and with nonlinearity (Fehr-Schmidt '00)

# Effects by subgroup

We can run basic specs for specific subgroups (faculty vs. staff, men vs. women, high vs. low tenure)

1. Female, staff, and low tenure highly responsive along job search intention (men, faculty, high tenure are not)
2. High tenure and staff particularly responsive along satisfaction index
3. Faculty are highly responsive when median is defined at **campus level** both below and above median (humanities resent econ/business/law, econ/business/law feel better seeing humanities)

**Appendix Table A5: Effect of Information Treatment -- by Subgroup**

<b>Panel A:</b>	Females	Males	Staff	Faculty	Low	High
					Tenure	Tenure
<b>Satisfaction Index</b>	(1)	(2)	(3)	(4)	(5)	(6)
I. Treated individual with wage < than median in pay unit (coefficient × 100)	-5.9 (3.5)	-6.7 (4.6)	-7.0 (3.5)	-3.1 (6.3)	-3.0 (3.8)	-9.5 (4.2)
II. Treated individual with wage > than median in pay unit (coefficient × 100)	3.8 (3.5)	-0.3 (4.0)	1.6 (2.9)	4.5 (5.8)	-2.7 (4.6)	3.3 (3.0)
II-I	9.7 (4.7)	6.3 (5.7)	8.6 (4.1)	7.6 (8.6)	0.3 (5.6)	12.8 (4.8)
P-value for exln. of treatment effects	0.11	0.35	0.09	0.66	0.64	0.03
Observations	3908	2503	5396	1015	2558	3853

**Appendix Table A5: Effect of Information Treatment -- by Subgroup**

<b>Panel B:</b>	Females	Males	Staff	Faculty	Low Tenure	High Tenure
<b>Very Likely to Look for New Job (Yes = 1)</b>	(1)	(2)	(3)	(4)	(5)	(6)
I. Treated individual with wage < than median in pay unit (coefficient × 100)	5.5 (2.2)	2.2 (3.3)	5.2 (2.0)	0.1 (3.6)	7.3 (2.6)	1.2 (2.5)
II. Treated individual with wage > than median in pay unit (coefficient × 100)	-3.8 (2.0)	0.4 (2.4)	-2.8 (1.8)	2.1 (3.4)	-1.4 (3.3)	-2.1 (1.7)
II-I	-9.2 (2.8)	-1.8 (4.5)	-8.0 (2.7)	2.1 (5.0)	-8.7 (4.0)	-3.3 (3.0)
P-value for exln. of treatment effects	0.01	0.77	0.01	0.82	0.02	0.42

**Appendix Table A7: Effect of Information Treatment on Job Satisfaction by Pay Relative to Campus/Occupation Median**

	Satisfaction Index (10 point scale)		Reports Very likely to Look for New Job (Yes = 1)		Dissatisfied and Likely Looking for a New Job (Yes=1)	
	Faculty	Staff	Faculty	Staff	Faculty	Staff
	(1)	(2)	(3)	(4)	(5)	(6)
I. Treated individual with wage $\leq$ than occupation/campus median	-16.9 (6.6)	-5.6 (3.5)	3.4 (3.7)	4.6 (2.1)	4.6 (3.3)	5.1 (2.0)
I. Treated individual with wage $>$ than occupation/campus median	16.7 (5.3)	0.0 (2.8)	-0.8 (3.2)	-2.0 (1.8)	-1.1 (2.1)	-0.3 (1.6)
II-I	33.5 (8.6)	5.6 (3.9)	-4.1 (4.9)	-6.6 (2.7)	-5.8 (3.9)	-5.4 (2.4)
Controls for campus and cubic in wage?	Yes	Yes	Yes	Yes	Yes	Yes
P-value for exclusion of treatment effects	0.00	0.25	0.64	0.05	0.32	0.03

# Placebo treatment

- Two possible concerns
  - Priming
  - Nonrandom selection into sample
- Placebo uses similar language as treatment but does not provide access to the database
- Placebo reduces the response rate by a similar magnitude as the information treatment

**Table 6: Estimates of the Effect of "Placebo"  
Treatment**

	Satisfaction Index (10 point scale)		
	Treatment	Placebo	p-value <sup>a</sup>
	(1)	(2)	(3)
Treated individual with wage less than median in pay unit	-8.6 (4.6)	1.7 (4.5)	0.04
Treated individual with wage more than median in pay unit	-1.5 (3.8)	-1.4 (3.7)	0.98
Controls for staff/faculty status and cubic in wage?	yes	yes	
Observations	2303	1880	

**Table 6: Estimates of the Effect of "Placebo" Treatment**

	Reports Very likely to Look for New Job (Yes = 1)			Dissatisfied and Likely Looking for a New Job (Yes = 1)		
	Treatment	Placebo	p-value <sup>a</sup>	Treatment	Placebo	p-value <sup>a</sup>
	(4)	(5)	(6)	(7)	(8)	(9)
Treated individual with wage less than median in pay unit	4.7 (2.8)	-3.3 (3.7)	0.06	7.8 (2.6)	-4.0 (3.2)	0.00
Treated individual with wage more than median in pay unit	-3.3 (2.5)	-1.9 (2.9)	0.63	-1.3 (1.8)	1.4 (2.1)	0.22
Controls for staff/faculty status and cubic in wage?	yes	yes		yes	yes	
Observations	2303	1880		2303	1880	

# Third stage: Effect on Actual Turnover

- In August 2011 we collected again email directory information to define a medium-term turnover indicator.
- Complications
  - SacBee (and others since then) information has diffused in 2-3 years to both treatment and control
  - Great recession sharply reduced job mobility opportunities
- Results:
  - Job search question highly predictive of actual turnover
  - Turnover higher in the treatment but only border-line significant

**Table 7: Effect of Information Treatment on Job Mobility**

	Survey	All Employees Who Could be Matched			
	Respondents Only	to Wage Data			
	(1)	(2)	(3)	(4)	(5)
Reported "very likely" to make a genuine effort to find a new job (coefficient × 100)	19.5 (1.62)	--	--	--	--
Reported "somewhat likely" to make a genuine effort to find a new job (coefficient × 100)	4.96 (1.20)	--	--	--	--
Treated individual with wage > median pay in unit (coefficient × 100)	--	1.42 (1.29)	0.84 (0.93)	--	--
Treated × wage in first quartile in pay unit (coefficient × 100)	--	2.61 (1.78)	2.30 (1.32)	--	--
Treated × wage in second quartile in pay unit (coefficient × 100)	--	-0.39 (1.64)	-0.71 (1.19)	--	--
Treated individual × deviation of rank from 0.5 if deviation negative (coefficient × 10)	--	--	--	-0.74 (0.51)	-0.63 (0.36)
Treated individual × deviation of rank from 0.5 if deviation positive (coefficient × 10)	--	--	--	0.43 (0.39)	0.27 (0.31)
Controls for campus × (staff/faculty) and cubic in wage?	Yes	Yes	Yes	Yes	Yes
Department fixed-effects	No	No	Yes	No	Yes
Observations	6,599	31,882	31,882	31,882	31,882

## Conclusions

- Our treatment design was effective in providing information about peers' pay
- Evidence is consistent with a utility function that imposes a negative cost for having wages below a reference-point, but little or no reward for having wages above the reference-point.
- Overall, results support conclusions of many previous observational and lab-based studies on relative income and worker satisfaction.
- Suggests that employers have a strong incentive to impose pay secrecy rules
- For future work: Are there endogenous changes in wage-setting policies and employee compensation?