Do Higher Wages Come at a Price?

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Summary

• Explore “effect” of wages on two measures of employee wellbeing
  – Job satisfaction (JS)
  – Contentment/anxiety at work (SWB)

• JS and SWB are positively correlated

• But opposite correlation with wages
  – JS +ve
  – SWB -ve

• Robust to very detailed job controls

• Wages relative to co-workers also matter
  – More so for JS
Motivation (and open questions)

- Are wellbeing measures alike in capturing work experiences?
- Do wage level effects differ from relative wage effects?
- Why does it matter?
  - anxiety/stress linked to ill-health/disease (Gardner and Oswald, 2004)
  - Potential implications for labour market behaviour (quits etc)
- How can we identify causal effects of wages?
  - Not there yet: need your help
Overview

• Theory and existing evidence
  – Wages and worker well-being
  – Wellbeing and productivity

• Data
  – WERS 2004
  – Well-being

• Empirical approach
  – Wage levels and relative wages
  – OLS; bivariate probit; workplace fixed effects
  – Model specification

• Results so far

• Next steps
Theory and Evidence: job satisfaction and wages

Positive association
- In levels and changes (Warr, 2007 for a review)
- Apparent too for non-pecuniary job satisfaction though weaker
- Wage rank matters (Brown et al., 2007)
- Non-linear? Warr’s “constant effect”

Mechanisms
- Compensating wage differential
  - but note employees often like hard work
- Fairness/reciprocity in wage bargain (Akerlof and Yellen)
- Affirmation of status (Fehr and Schmidt, 1999)
- Relative to expectations/anticipation
- Reverse causation: satisfaction -> productivity -> wages
Theory and Evidence: anxiety and wages

Context free anxiety
• Low paid experience greater anxiety (Gardell, 1971)
• No association (Clark et al., 1996)
• Nothing on wages and job-induced stress/anxiety

Mechanisms
• Wage compensation for taking on stressful tasks
• Reverse causation: anxiety -> productivity -> wages
  – Kahneman’s mental arousal (1973); Warr (2007) says non-linear
  – Challenge and hindrance stressors (Lepine et al., 2005)
• Joint determination of anxiety and wages by unobservable worker traits
• Anxiety engendered by desire to justify higher pay
  – true causal impact
• Stressfulness of wage comparisons (Leigh and Jencks, 2006)
  – true causal impact
Data

- 2004 WERS survey: nationally representative survey of all workplaces in Britain with 5+ employees
- Data collected via face-to-face interview with senior manager responsible for personnel issues
- Sample for analysis: private sector workplaces with 5+ employees
- Linked employee data collected via self-completion questionnaire
Warr’s Framework for Measuring Job-related Affect
SWB measure

- “Thinking of the past few weeks how much of the time has your job made you feel each of the following.. tense, calm, relaxed, worried, uneasy, content?”

- Responses: “all of the time”, “most of the time”, “some of the time”, “occasionally”, “never”

- Warr’s (2007: 19-49) anxiety-contentment axis for measuring SWB

- Single summative scale (-12,12) having recoded each item. Cronbach’s Alpha: 0.85. High values = contentment
Job satisfaction measures

• “How satisfied are you with the following aspects of your job?... achievement you get from your work; the scope for using your own initiative; the amount of influence you have over your job; the training you receive; the amount of pay you receive; your job security; the work itself; the amount of involvement you have in decision-making at this workplace?”

• Responses: “very satisfied” to “very dissatisfied”. 5-point Likert scale

• JS captures the pleasure-displeasure axis in Warr’s concept of subjective well-being

• Single summative global job satisfaction (GJS) scale (-16,16) having recoded each item. Cronbach’s Alpha: 0.85

• Non-pecuniary job satisfaction (NPJS) scale (-14,14)

• Pay satisfaction (1,5)
Job related data

Wages

- Hourly wage: mid-points of banded pre-tax weekly wage divided by continuous hours
- Sensitivity to log wages, quadratic terms, quartiles in hourly wage distribution

1 digit or 3 digit occupation

Job autonomy/controls

- “In general, how much influence do you have over the following... What tasks you do in your job, the pace at which you work, how you do your work, the order in which you carry out tasks, the time you start or finish your working day?”
- Four point response scale “a lot, some, a little, none”

Effort

- Overtime hours
- Supervisory status
- “My job requires that I work very hard”
Other Data Items

**Workplace characteristics**
- Log N employees and quadratic
- **Part of larger organisation**
- Industry sector
- **Region**
- Urban location
- TTWA unemployment rate

**Job**
- Occupation: single digit or 3-digit
- Hours and hours squared
- Overtime hours
- **Supervisory status**
- Job autonomy/discretion
- My job requires I work very hard

**Employee Characteristics**
- Age
- Gender
- Ethnicity
- Disability
- Dependent children
- Academic qualifications
- **Vocational qualifications**
- Home carer status
- Marital status
- Has dependent children
- Union member
- Covered by collective bargaining
Empirical Approach

• Estimation
  – OLS: raw; parsimonious; full
  – bivariate probit estimating JS and SWB jointly
  – Workplace FE

• All unweighted, robust estimator; clustering for individual-level analyses
• Whole private sector and separate for men and women
• Experimented with IV but yet to find suitable instruments that can reasonably be excluded from the wellbeing equations
• N=11,467 employees clustered in 1,218 private sector workplaces
OLS

\[ W_{if} = \beta_1 \text{Wage}_{if} + \beta'_x X_{if} + \beta'_y X_f + \varepsilon_{if} \]

- \( W_{if} \) expresses well-being (or job satisfaction) of individual i in workplace f, \( \text{Wage}_{if} \) expresses wage of individual i in workplace f (different measures), \( X_{if} \) is vector of individual-level demographic and job characteristics, \( X_f \) expresses vector of workplace controls shared by all sampled in same workplace. \( \varepsilon_{if} \) represents a standard normal distributed error term.
- \( \beta_1 \) gives the effect of wages on wellbeing on the assumption that wages are independent of wellbeing conditional on the other X’s we include in the model.
Bivariate probit

- Concern: SWB and JS jointly determined by factors not accounted for in the model, eg. unobserved fixed employee characteristics
- Estimates association between wages and JS and SWB simultaneously
- Assuming joint normal distribution in error terms
- Produces parameter representing correlation between errors
- Wald test rejects null that correlation is equal to zero
Workplace FE

• Workplace dummies replace workplace controls thus controlling for fixed unobserved workplace characteristics

• FE also capture mean workplace wages to identify importance of wage relativities for SWB and JS

\[ W_{if} = A + \alpha \text{wage}_{if} + \beta (\text{wage}_{if} - \text{Wage}_f) + u_{if} \]

• \( \alpha \) measures the effect of individual own wage on wellbeing, and \( \beta \) measures the effect of relative wage within the workplace
OLS and Workplace FE

• Running OLS as per eq (1) \( W_{if} = \Lambda + aw_{if} + e_{if} \)

• In that case \( a = \alpha + \beta \), and \( e_{if} = u_{if} - \beta W_f \)

• Hausman: tests null for equality of coefficients in FE and OLS
  • null is rejected, ie. FE preferred, OLS biased

• Comparing wage effects in FE and OLS allows us to infer role of relative wages as well as own wage (cf Steve Pischke’s presentation a few weeks ago)
## OLS for correlation between wages and SWB

<table>
<thead>
<tr>
<th></th>
<th>Model (1) No controls</th>
<th>Model (2) Parsimonious</th>
<th>Model (3) Full</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Hourly wage</strong></td>
<td>-.067</td>
<td>-.032</td>
<td>-.040</td>
</tr>
<tr>
<td><strong>Adj. r-squared</strong></td>
<td>0.04</td>
<td>0.08</td>
<td>0.18</td>
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<tr>
<td><strong>t-value</strong></td>
<td>(9.45)**</td>
<td>(3.80)**</td>
<td>(4.91)**</td>
</tr>
</tbody>
</table>
### OLS for correlation between wages and Job satisfaction

<table>
<thead>
<tr>
<th></th>
<th>Model (1)</th>
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<tbody>
<tr>
<td></td>
<td>No controls</td>
<td>Parsimonious</td>
<td>Full</td>
</tr>
<tr>
<td><strong>GJS</strong></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Hourly wage</td>
<td>0.073</td>
<td>0.100</td>
<td>0.030</td>
</tr>
<tr>
<td></td>
<td>(7.29)**</td>
<td>(8.31)**</td>
<td>(3.09)**</td>
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<tr>
<td>Adj. r-squared</td>
<td>0.01</td>
<td>0.11</td>
<td>0.30</td>
</tr>
<tr>
<td><strong>NPJS</strong></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Hourly wage</td>
<td>0.042</td>
<td>0.069</td>
<td>0.003</td>
</tr>
<tr>
<td></td>
<td>(4.87)**</td>
<td>(6.69)**</td>
<td>(0.35)</td>
</tr>
<tr>
<td>Adj. r-squared</td>
<td>0.01</td>
<td>0.11</td>
<td>0.31</td>
</tr>
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</table>
Bivariate probit for correlation between hourly wages, SWB and JS

<table>
<thead>
<tr>
<th></th>
<th>Wellbeing</th>
<th>Satisfaction</th>
<th>atrrho</th>
<th>Wald r=0</th>
<th>P for Wald</th>
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<tbody>
<tr>
<td><strong>Panel A: global job satisfaction</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>M (1) Raw</td>
<td>-.015</td>
<td>.014</td>
<td>.511</td>
<td>927.68</td>
<td>0.0000</td>
</tr>
<tr>
<td></td>
<td>(7.83)**</td>
<td>(6.06)**</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>M (2) Parsimonious</td>
<td>-.0065</td>
<td>.021</td>
<td>.514</td>
<td>848.48</td>
<td>0.0000</td>
</tr>
<tr>
<td></td>
<td>(2.87)**</td>
<td>(7.33)**</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>M (3) Full</td>
<td>-.0082</td>
<td>.007</td>
<td>.498</td>
<td>729.36</td>
<td>0.0000</td>
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<tr>
<td></td>
<td>(3.35)**</td>
<td>(2.67)**</td>
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<tr>
<td><strong>Panel B: non-pecuniary job satisfaction</strong></td>
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<td></td>
</tr>
<tr>
<td>M (1) Raw</td>
<td>-.015</td>
<td>.010 (4.51)**</td>
<td>.511</td>
<td>902.88</td>
<td>0.0000</td>
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<tr>
<td></td>
<td>(7.86)**</td>
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</tr>
<tr>
<td>M (2) Parsimonious</td>
<td>-.007</td>
<td>.016(5.74)**</td>
<td>.519</td>
<td>838.05</td>
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<td></td>
<td>(2.90)**</td>
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<tr>
<td>M (3) Full</td>
<td>-.0083</td>
<td>.0009 (0.33)</td>
<td>.512</td>
<td>734.12</td>
<td>0.0000</td>
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<td></td>
<td>(3.40)**</td>
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**Workplace FE models for SWB**

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<tr>
<td>Hourly wage</td>
<td>-.063</td>
<td>-.045</td>
<td>-.046</td>
</tr>
<tr>
<td></td>
<td>(7.62)**</td>
<td>(4.83)**</td>
<td>(5.06)**</td>
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<tr>
<td>Adj. r-squared</td>
<td>0.10</td>
<td>0.13</td>
<td>0.21</td>
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### Workplace FE models for Job Satisfaction

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<td><strong>GJS</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hourly wage</td>
<td>.127</td>
<td>.114</td>
<td>.036</td>
</tr>
<tr>
<td></td>
<td>(11.92)**</td>
<td>(9.60)**</td>
<td>(3.62)**</td>
</tr>
<tr>
<td>Adj. r-squared</td>
<td>0.16</td>
<td>0.19</td>
<td>0.36</td>
</tr>
<tr>
<td><strong>NPJS</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hourly wage</td>
<td>.100</td>
<td>.088</td>
<td>.015</td>
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<td></td>
<td>(10.92)**</td>
<td>(8.63)**</td>
<td>(1.77)</td>
</tr>
<tr>
<td>Adj. r-squared</td>
<td>0.16</td>
<td>0.19</td>
<td>0.36</td>
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</table>
Comparison of hourly wage coefficients in the OLS and Workplace Fixed Effects Models

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<td>Full</td>
</tr>
<tr>
<td><strong>Panel A: SWB</strong></td>
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<tr>
<td>Fixed effects model</td>
<td>-.063</td>
<td>-.045</td>
<td>-.046</td>
</tr>
<tr>
<td>OLS</td>
<td>-.067</td>
<td>-.032</td>
<td>-.040</td>
</tr>
<tr>
<td>Bias</td>
<td>-.005 (.005)</td>
<td>.013 (.005)**</td>
<td>.007 (.004)</td>
</tr>
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<td><strong>Panel B: GJS</strong></td>
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<tr>
<td>Fixed effects model</td>
<td>.127</td>
<td>.114</td>
<td>.036</td>
</tr>
<tr>
<td>OLS</td>
<td>.073</td>
<td>.100</td>
<td>.030</td>
</tr>
<tr>
<td>Bias</td>
<td>-.053 (.006)**</td>
<td>-.014 (.005)**</td>
<td>-.006 (.005)</td>
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<tr>
<td><strong>Panel C: NPJS</strong></td>
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<tr>
<td>Fixed effects model</td>
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<td>OLS</td>
<td>.042</td>
<td>.069</td>
<td>.003</td>
</tr>
<tr>
<td>Bias</td>
<td>-.057 (.005)**</td>
<td>-.020 (.005)**</td>
<td>-.013 (.004)**</td>
</tr>
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</table>
## Comparison of hourly wage coefficients in the OLS and Workplace Fixed Effects Models for Pay Satisfaction

<table>
<thead>
<tr>
<th>PJS</th>
<th>Model (1)</th>
<th>Model (2)</th>
<th>Model (3)</th>
</tr>
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<tr>
<td></td>
<td>No controls</td>
<td>Parsimonious</td>
<td>Full</td>
</tr>
<tr>
<td>Fixed effects model</td>
<td>.027</td>
<td>.026</td>
<td>.021</td>
</tr>
<tr>
<td>OLS</td>
<td>.031</td>
<td>.031</td>
<td>.027</td>
</tr>
<tr>
<td>Bias</td>
<td>.044 (.001)**</td>
<td>.006 (.000)**</td>
<td>.006 (.000)**</td>
</tr>
</tbody>
</table>
Results Summary

• **SWB**
  - Hourly wages negatively correlated with SWB
  - Linear effects
  - Negative correlation robust to workplace FE
  - Wage relativities not that important but seems higher wages relative to work colleagues is associated with greater anxiety/less contentment
  - Results similar for men and women
  - Effort negatively correlated with SWB

• **JS**
  - Hourly wages positively correlated with GJS and NPJS though NS for NPJS with full job controls
  - Linear effects
  - Positive correlation robust to workplace FE
  - Relative wage important: higher JS when you are paid more relative to colleagues
  - Results similar for men and women
  - Effort positively correlated with NPJS but negatively correlated with PJS
Interpretation (so far)

- Hourly wages associated with higher JS but lower SWB
  - To our knowledge, these are only results for SWB in the literature
- Interpretations
  - Higher wages part of a wage-effort bargain which we only partially observe. Higher wages therefore compensating for taking on more stressful tasks. Employees happy (satisfied) in taking these jobs even though they induce stress.
  - Effort proxies positively correlated with JS, negatively correlated with SWB, lending further support to this interpretation.
  - Unobservable factors may induce anxiety and higher wages, eg. mental arousal leading to higher productivity
  - Wages can generate anxiety as employees seek to justify higher pay
- Relative wages have different effects on SWB and JS
  - Not particularly important for SWB
  - Higher own wages relative to workplace average wages increase JS
- How to account for unobservable individual characteristics inducing desire for hard work, higher wages and thus stress?
Next

• Plug in employee’s distance from workplace mean wage instead of workplace FE
• Run between establishment estimators
• How to instrument wages?
  – How about public sector ‘shadow’ wage for occupations in the locality?
  – Public sector wages set centrally so exogenous wrt local wage setting
  – Able to distinguish occupational wages within establishment
  – Still worried about worker sorting