“I Don’t Work for Money”
The Motives of Scientists and Engineers

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Formal IP and Individuals’ Incentives

- In addition to providing firms with investment incentives to conduct R&D, IP is also supposed to provide financial incentives for individuals to undertake inventive activity.

- Underlying assumption: Individuals care (a lot) about pecuniary gain from their inventive efforts

- But how much are individuals engaged in invention driven by money vs. other factors?

- How do individuals’ various motives affect innovative effort and performance?

- Do individuals’ motives and performance differ between startups and established firms?
… most seemed to view the prospect of stock as a mere sweetener, and most agreed with Ken Holberger, sublieutenant of Hardy Boys, who declared “I don’t work for money.”
Data on Scientists and Engineers

SESTAT 2003 restricted-access data (National Science Foundation)

• Population: Individuals who are either trained in science and engineering fields or work in S&E
• Mailed surveys
• Full sample (N=29,190):
  ○ Employed in startups, established firms, and academia
  ○ R&D among two most important activities
• Firm sample (N=9,609):
  ○ Employed in startups, established firms
  ○ R&D is most important activity
Key Measures

- **Motives**: “In thinking about a job, how important is each of the following to you” (4 pt. scale)
  - Salary
  - Fringe benefits
  - Job security
  - Intellectual challenge
  - Independence
  - Opportunities for advancement
  - Responsibility
  - Contribution to society

- **Effort**: Hours worked in a typical work week

- **U.S. patent applications in last five years**

- **Firm size and firm age used to define startups (<100 employees, <6 years) and large established firms (>500 employees, >5 years)**
Controls in Regression Analysis

- Productivity determinants
  - Industry level: industry dummies
  - Firm level: firm fixed effects (for subsample)
  - Individual level: experience, degree, field, work type, non-R&D activities, recent job change, etc.

- Other controls
  - Base pay (but not contingent pay)
  - Managerial status, age, gender, race, children, etc.
Motives in Academia, Startups, and Large Firms

- **Academia**
- **Startups**
- **Large est. firms**

<table>
<thead>
<tr>
<th>Motive</th>
<th>Academia</th>
<th>Startups</th>
<th>Large est. firms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Salary</td>
<td>3.5</td>
<td>3.25</td>
<td>3.25</td>
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<tr>
<td>Benefits</td>
<td>3.5</td>
<td>3.25</td>
<td>3.25</td>
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<tr>
<td>Job security</td>
<td>3.5</td>
<td>3.25</td>
<td>3.25</td>
</tr>
<tr>
<td>Intellectual challenge</td>
<td>3.75</td>
<td>3.5</td>
<td>3.25</td>
</tr>
<tr>
<td>Independence</td>
<td>4.0</td>
<td>3.75</td>
<td>3.25</td>
</tr>
<tr>
<td>Opportunities advancement</td>
<td>3.25</td>
<td>3.5</td>
<td>3.25</td>
</tr>
<tr>
<td>Responsibility</td>
<td>3.5</td>
<td>3.25</td>
<td>3.25</td>
</tr>
<tr>
<td>Contribution to society</td>
<td>3.5</td>
<td>3.25</td>
<td>3.25</td>
</tr>
</tbody>
</table>
Firm Sample: Motives and Performance

- Average # of patent applications (firm sample)
- But: Need to consider potential confounds and indirect effects
Firm Sample: Motives, Effort, and Performance

- Individuals’ motives have significant impacts on innovative effort, but effects differ
  - Strongest positive effect: importance of intellectual challenge

- Pecuniary and non-pecuniary motives affect innovative performance, even controlling for effort (“productivity effects”)
  - Strong positive effect: intellectual challenge, smaller effects of independence, salary
  - Negative effect of importance of job security

- Results robust to inclusion of ability measures and firm fixed effects
Firm Sample: Startups vs. Established Firms

- Stronger salary, benefits, and job security motives in large established firms, surprisingly similar non-pecuniary motives
- Individuals in startups expend more effort than individuals in large established firms (ca. 3 hours)
  - Partially explained by demographic differences
  - Not explained by differences in motives
- Individuals in startups have more patent applications (ca. 30%)
  - Individuals in startups have lower desire for job security, which is negatively associated with innovative productivity
  - Individuals in startups expend more effort
  - Much of the “performance advantage” is due to recent hires. Selection effects at firm and individual levels?
- Results robust to inclusion of ability measures
Implications

- While formal IP appeals to individuals’ pecuniary motives, nonpecuniary motives for work may be more salient to individuals, especially in the innovation context.

- Nonpecuniary motives may also be associated with higher levels of innovation than pecuniary motives.

- Some authors suggest that pecuniary rewards may negatively impact intrinsic motives (e.g., Deci & Ryan 1999), though relevant empirical evidence is very limited.

→ Need to consider individuals’ pecuniary as well as non-pecuniary motives and incentives and their interplay.
Thank you.

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