Career Concerns as Public Good

The Role of Signaling for Open Source Software Development

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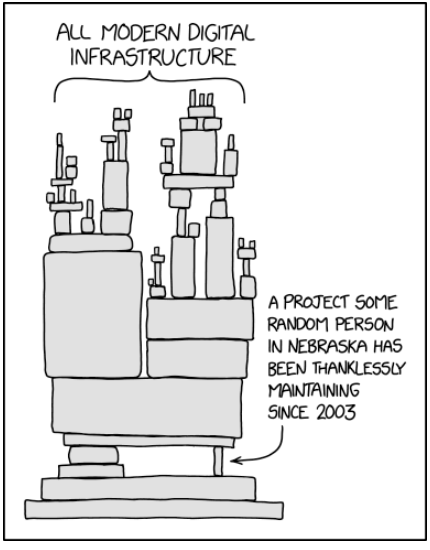
Motivation



- open source software (OSS) is a valuable public good
  - 96% of software codebases contain OSS (Synopsys, 2023)
  - equiv. 7.2% of software investment (USD37bn/yr) (Korkmaz et al., 2024)
- decentralized community of volunteer developers
- motivation to contribute hard to rationalize

▶ **Are OSS developers motivated by labor market signaling incentives?**

Related literature

- Lerner and Tirole (2002) already theorized signaling could be a motivation of OSS contributors
- subsequent literature almost exclusively relies on surveys (i.e., stated preferences approach)
  - e.g., von Krogh et al. (2012); Krishnamurthy (2006); Hars and Ou (2002); Hertel et al. (2003); Stewart and Gosain (2006); Lakhani and Wolf (2003); Hann et al. (2004); Gerosa et al. (2021)
- in a theory model, Leppämäki and Mustonen (2009) highlight the role of signaling for positive externalities through public good generation

▶ **So far, no causal evidence of signaling channel in OSS software production.**

  - Notably, Xu et al. (2020) show career concerns/labor market signaling drives a significant portion of reputation-generating activity on an online Q&A forum.

Empirical approach

Difference-in-differences

- look at job changers and their activity in the job search period
- compare job movers versus other movers

Event study specification

$$y_{it} = \beta_1 + \sum_{j=\underline{T}}^{\overline{T}} \left[\beta_j \left(t_j \times \text{JobChanger}_i \right) \right] + \delta_i + \delta_{s(t)} + \delta_{a(i)t} + e_{it},$$

$y_{i,j}$	number of user *i*'s commits in month *t* (IHS)
δ_i	user fixed effects
$\delta_{s(t)}$	month fixed effects
$\delta_{a(i)t}$	user experience fixed effects
e_{it}	error term

Results: signaling activity

Results: difference-in-differences

IHS(single commits)	(1)	(2)	(3)
Job mover × job search	0.2595***	0.2230***	0.1177***
	(0.0088)	(0.0093)	(0.0091)
Job mover × post move	-0.2154***	-0.1738***	-0.0813***
	(0.0120)	(0.0131)	(0.0123)
User FE	×	×	×
Month FE		×	×
Experience FE			×
Adjusted R^2	0.139	0.154	0.217
Observations	1,717,200	1,717,200	1,717,200
Users	22,896	22,896	22,896

- back-of-the-envelope calculation → **≈4.9% of overall OSS production**

Results: heterogeneity

- signaling projects focus less on (direct) community use-value (stars, forks)
- signaling activity concentrates on labor market value and external visibility
  - higher-valued programming languages
  - in web development and data engineering
  - keywords for coding and (personal) website
- users' signaling activity
  - higher for international/-continental movers
  - higher when moving to academia
  - lower when moving to big tech

- career concerns have **positive externalities** on OSS, a valuable public good
- **direction of OSS development** driven by signaling is different
  - focused more on labor market value and
  - less on direct community use-value
- results suggest signaling through OSS is higher for developers
  - with weaker credentials (international movers) and
  - close to communities that value openness (academia)

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Thanks,

what are your questions?

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