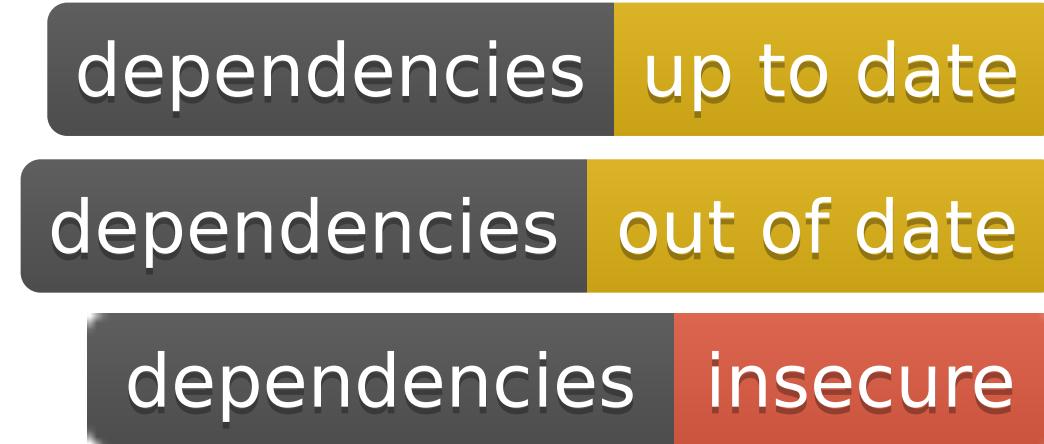


# CI / CD Pipeline Tools and Their Signals

Bogdan Vasilescu  
Microsoft Faculty Summit 2018

joint work with Trockman, Zhou, Kästner. ICSE 2018

# Tools being used in



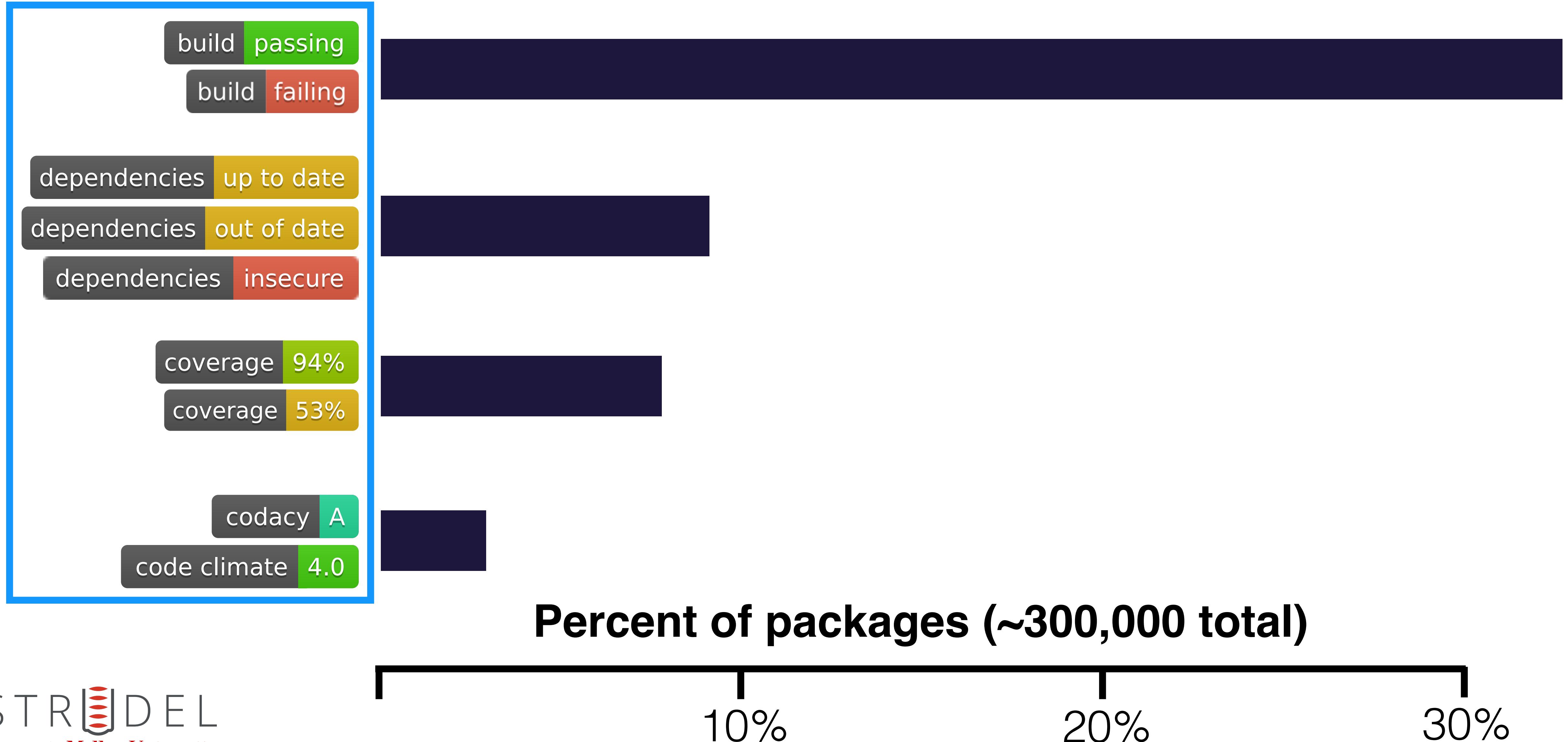
Percent of packages (~300,000 total)

10%

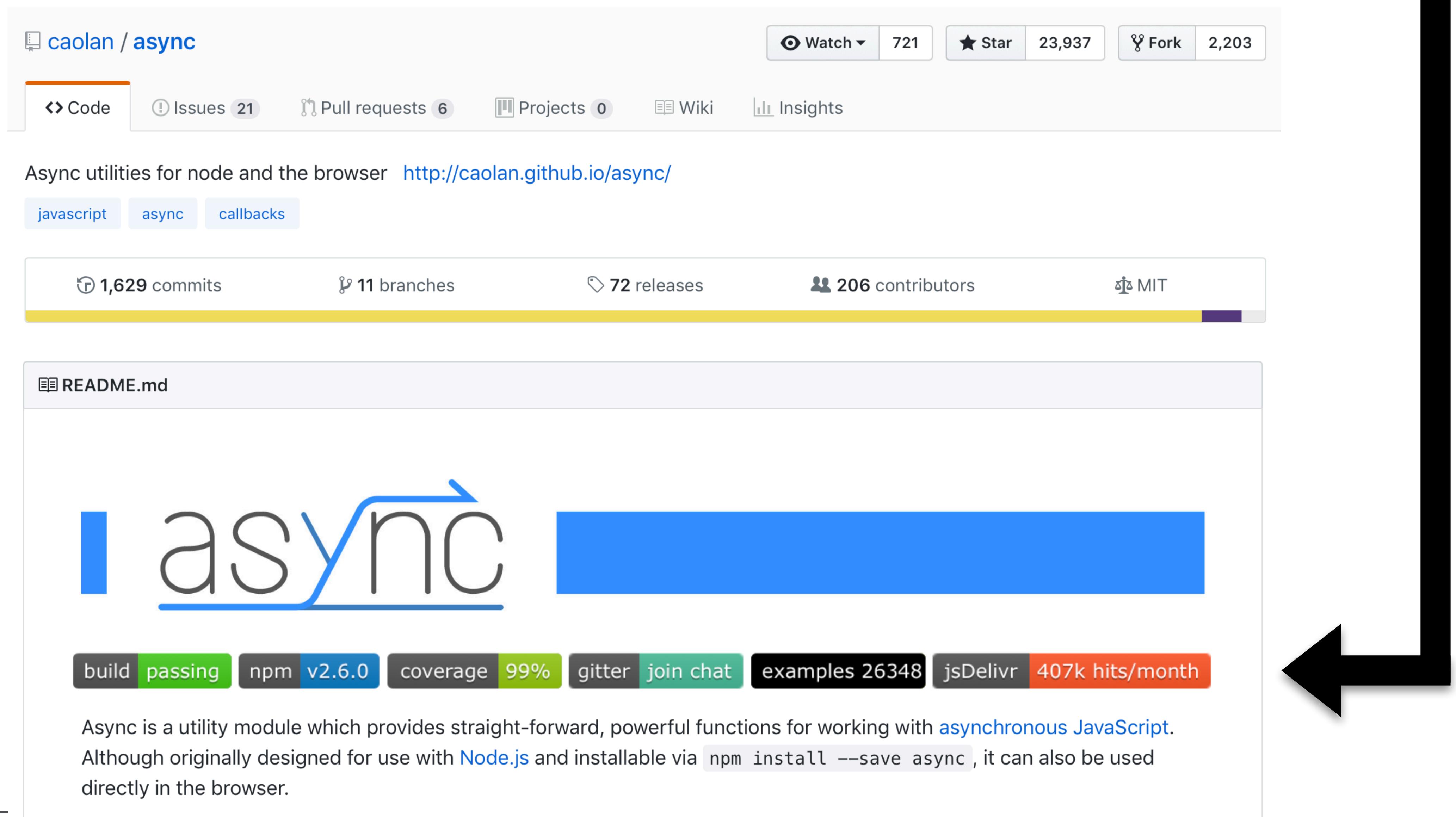
20%

30%

# Tools being used in



# GitHub Repository Badges



A screenshot of a GitHub repository page for the 'caolan/async' repository. The page shows the repository's statistics: 1,629 commits, 11 branches, 72 releases, 206 contributors, and an MIT license. Below the stats, there is a large image of the word 'async' with a blue underline. At the bottom, there are several badges: build passing (green), npm v2.6.0 (blue), coverage 99% (green), gitter (grey), join chat (green), examples 26348 (black), jsDelivr 407k hits/month (red), and a large black arrow pointing left on the right side.

caolan / **async**

Watch 721 Star 23,937 Fork 2,203

Code Issues 21 Pull requests 6 Projects 0 Wiki Insights

Async utilities for node and the browser <http://caolan.github.io/async/>

javascript async callbacks

1,629 commits 11 branches 72 releases 206 contributors MIT

README.md

async

build passing npm v2.6.0 coverage 99% gitter join chat examples 26348 jsDelivr 407k hits/month

Async is a utility module which provides straight-forward, powerful functions for working with [asynchronous JavaScript](#). Although originally designed for use with [Node.js](#) and installable via `npm install --save async`, it can also be used directly in the browser.

Enlarged to show detail.

# Social coding: Transparency & signaling

[request / request](#)

Watch ▾ 417 Star 18,384 Fork 2,196

Code Issues 578 Pull requests 52 Projects 0 Wiki Insights

Simplified HTTP request client.

2,199 commits 17 branches 134 releases 270 contributors Apache-2.0

Branch: master New pull request Create new file Upload files Find file Clone or download ▾

mikeal committed on Sep 27, 2017 2.83.1 Latest commit 253c5e5 on Sep 27, 2017

File	Description	Time Ago
.github	small change to template wording	a year ago
examples	Adds example for Tor proxy	2 years ago
lib	refactor(lint): replace eslint with standard (#2579)	11 months ago
tests	lint fix, PR from pre-standard was merged with passing tests	10 months ago
.gitignore	Updating deps.	5 months ago
.travis.yml	Add Node.js v8 to Travis CI	7 months ago
CHANGELOG.md	Update changelog	11 months ago
CONTRIBUTING.md	Update contributing guidelines	2 years ago
LICENSE	Adding license information.	7 years ago

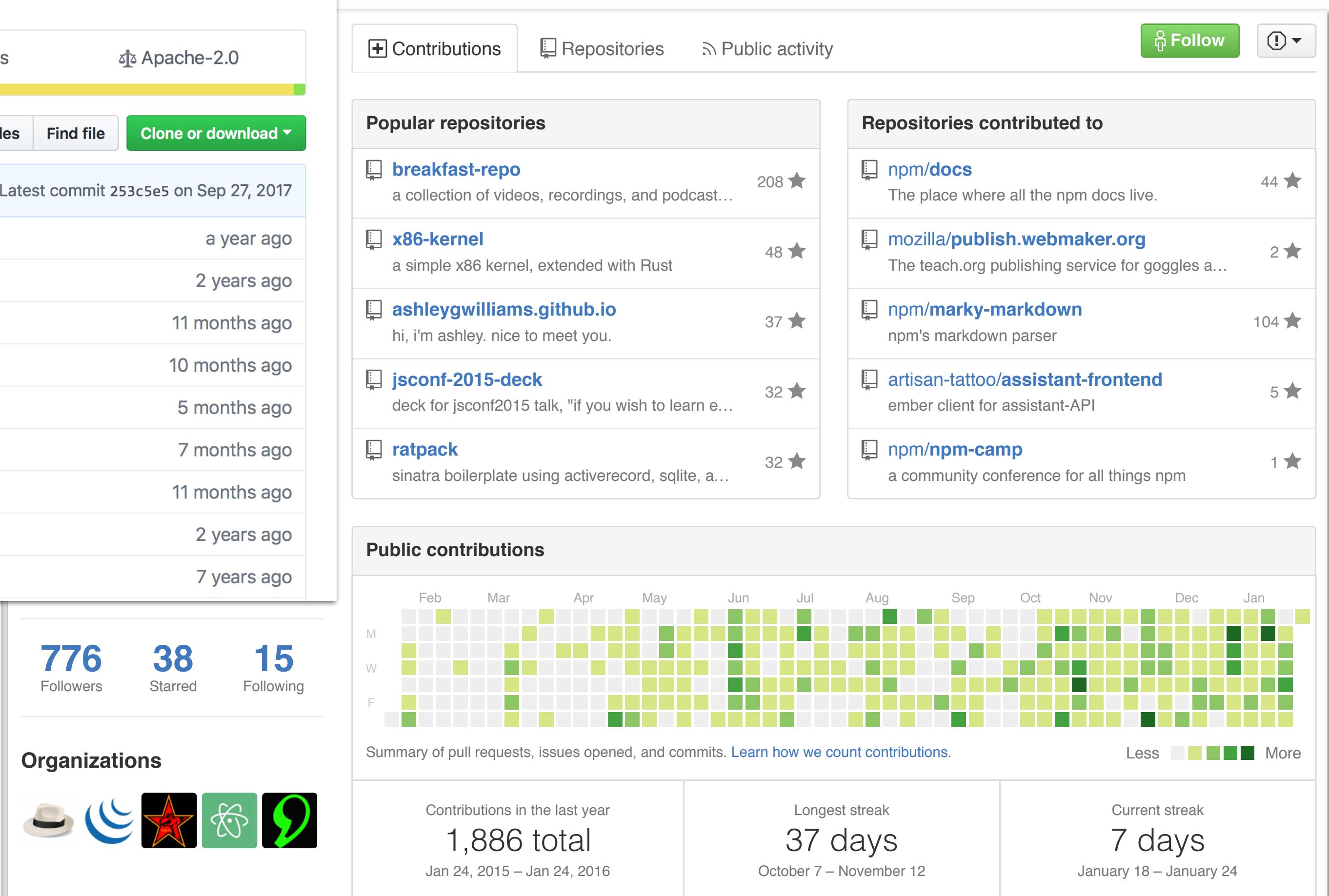
## Projects

776 Followers 38 Starred 15 Following

Organizations

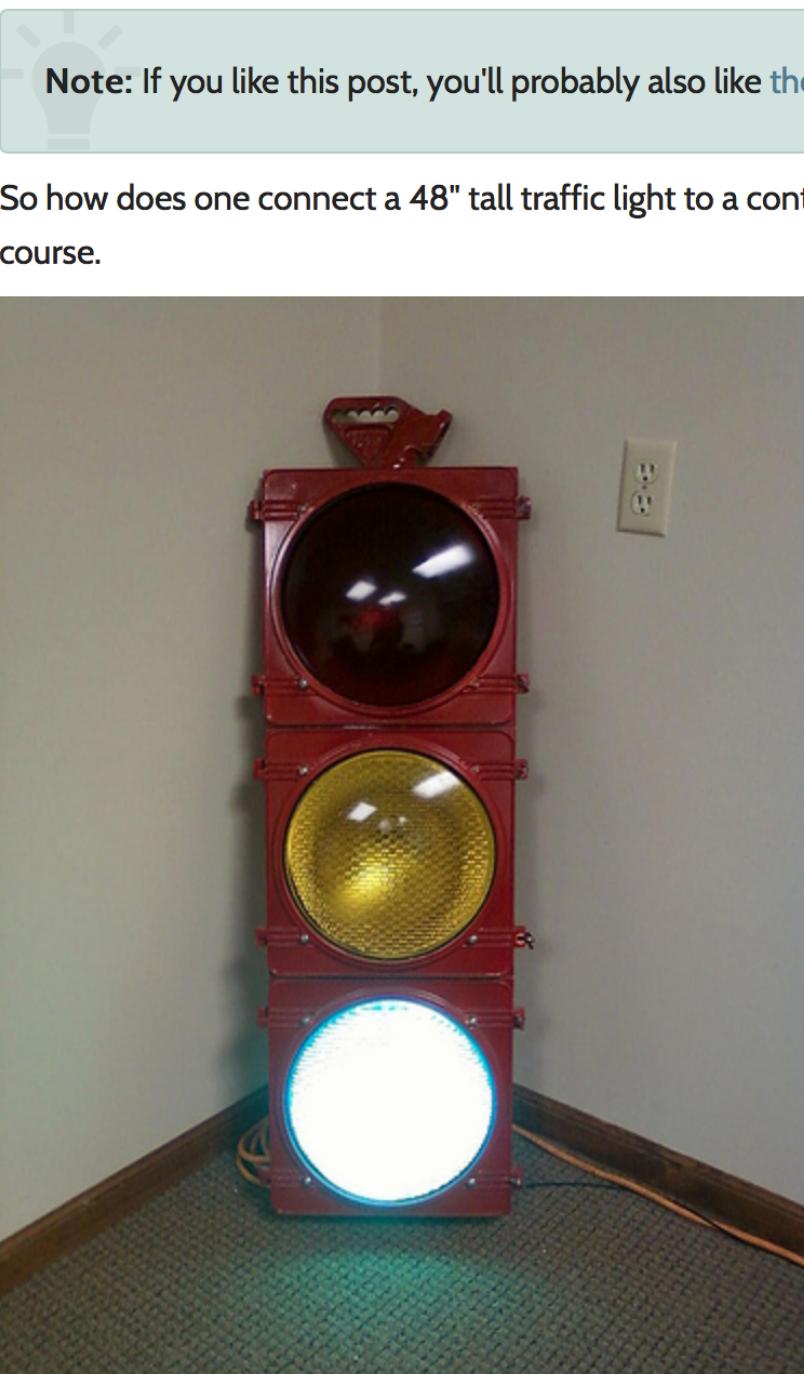


## Users



# Signals can also be physical

## MONITORING YOUR CONTINUOUS INTEGRATION SERVER WITH TRAFFIC LIGHTS AND AN ARDUINO



## Continuous Integration of Shame

A conversation on Twitter recently popped up on the use of physical objects to denote build status. You know what I mean: “You broke the build, so you get the rubber chicken! And have to display it on your desk until *someone else* breaks the build!”



Build status: plucky. Photo credit: James Shore.

“Peer monitoring”

Phillips, Zimmermann, Bird. Understanding and improving software build teams. ICSE 2014

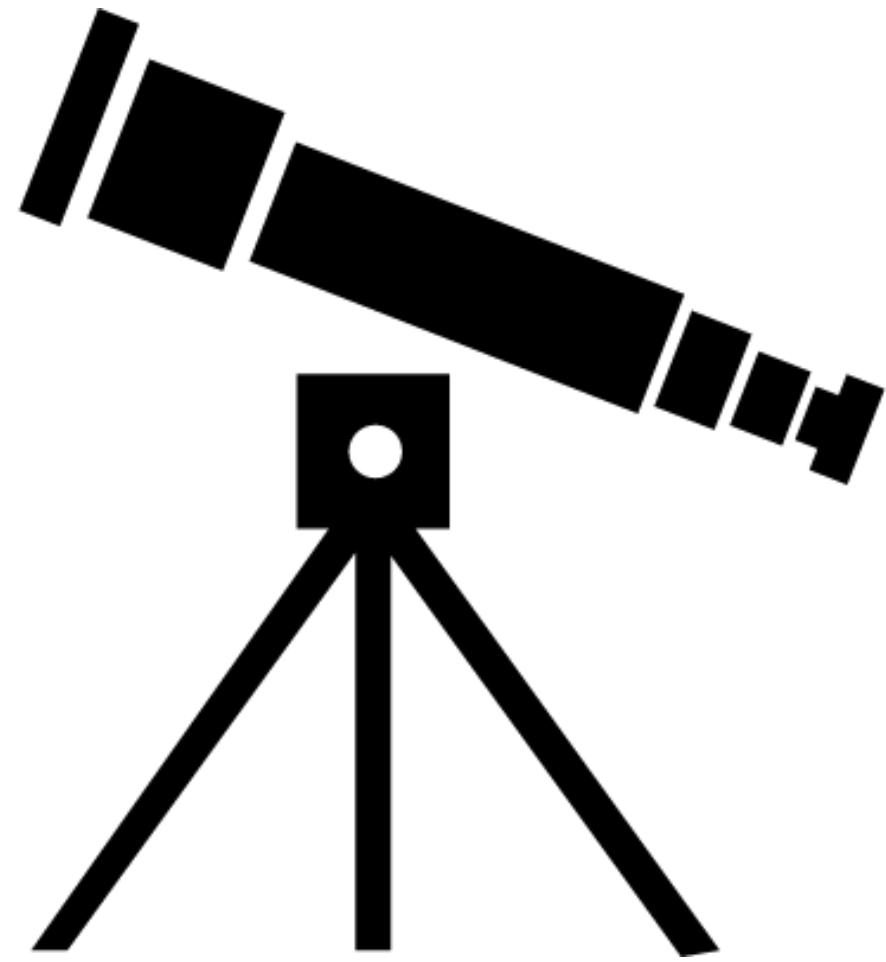
# What do developers expect from badges?

“welcoming contributions”

- 32 Maintainers
  - What do you intend to signal?
  - What effects do you expect?
    - “expectations of contribution quality”
- 57 Contributors
  - What do badges tell you?
    - “dedicated to offering support”
- - “reduced chances of conflicting versions of dependencies”

“indicator of product quality”

# Analysis



## Correlation

If all you saw was the badge, how much would that tell you?



## Regression Analysis

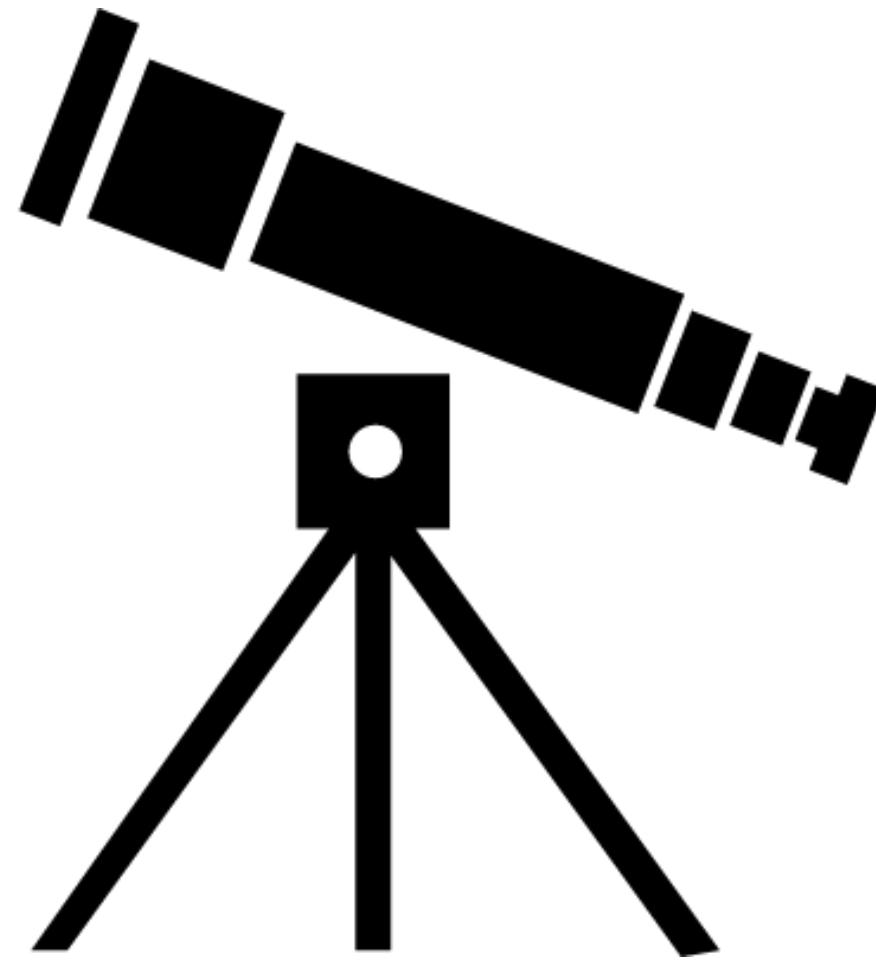
How much more does the badge tell you, relative to existing signals?



## Time Series Analysis

How do things change after adding the badge?

# Analysis



## Correlation

If all you saw was the badge, how much would that tell you?



## Regression Analysis

How much more does the badge tell you, relative to existing signals?

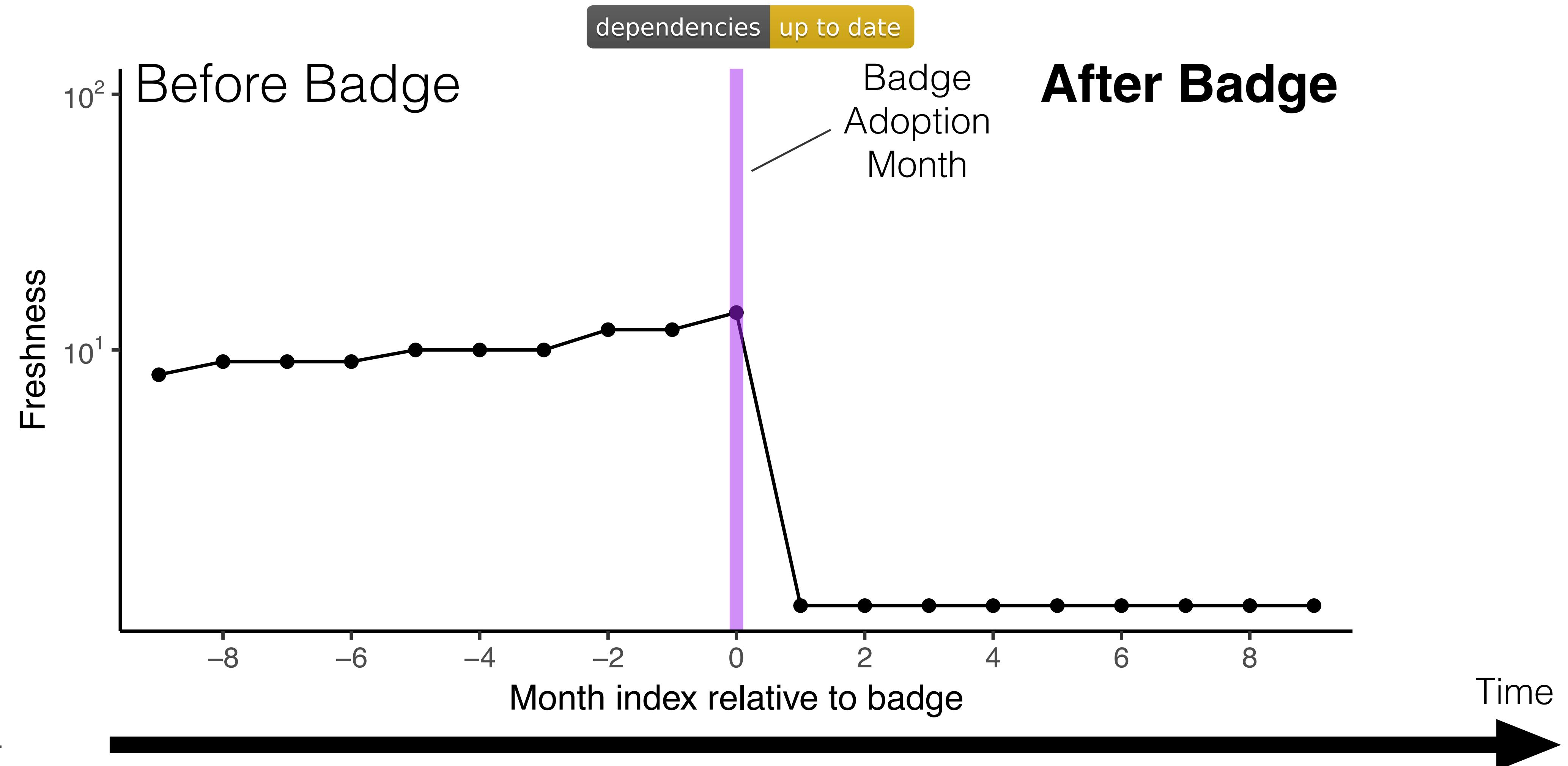


## Time Series Analysis

How do things change after adding the badge?

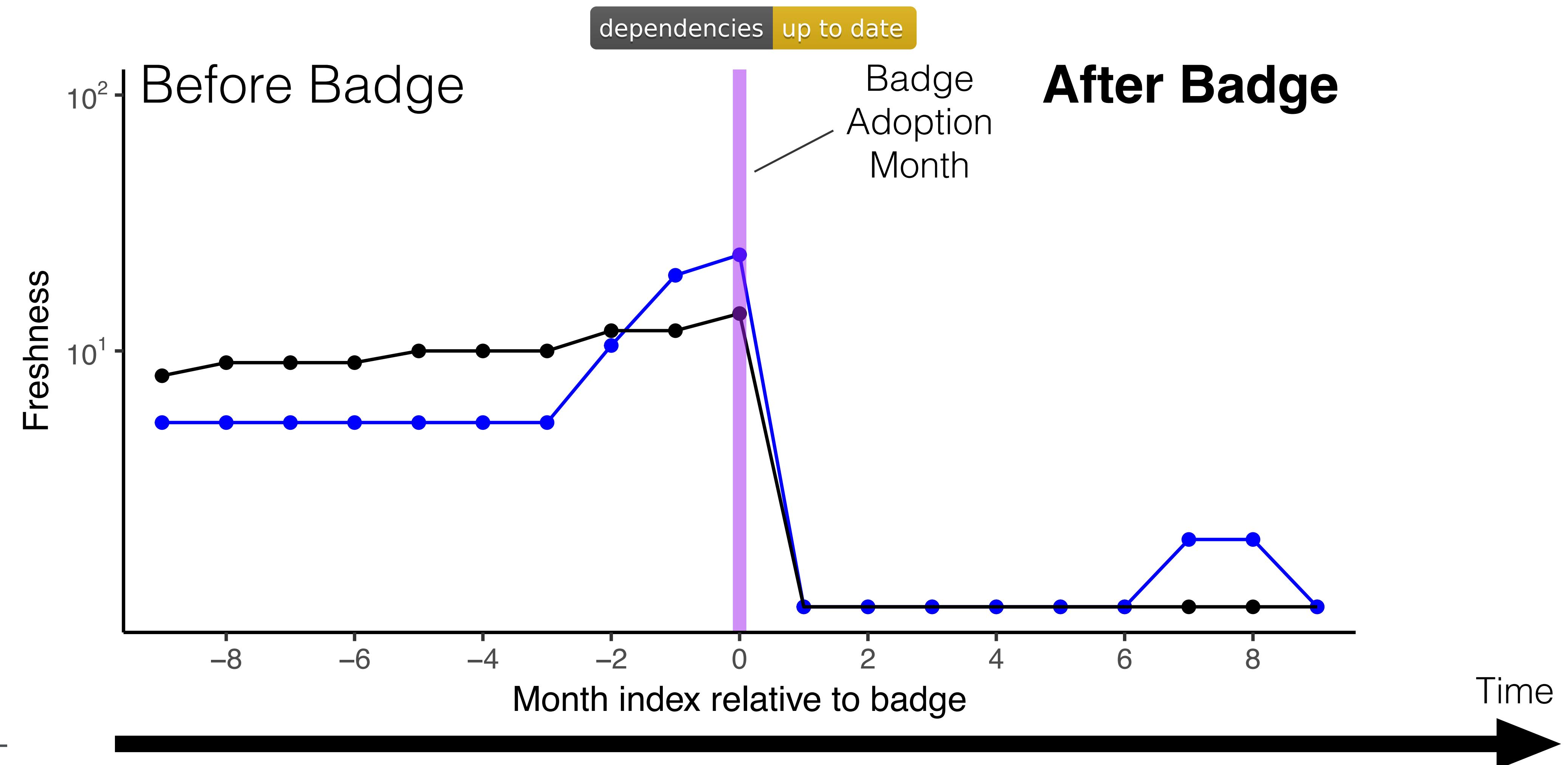
## Step 3: Time Series Analysis

# Signals of fresh dependencies



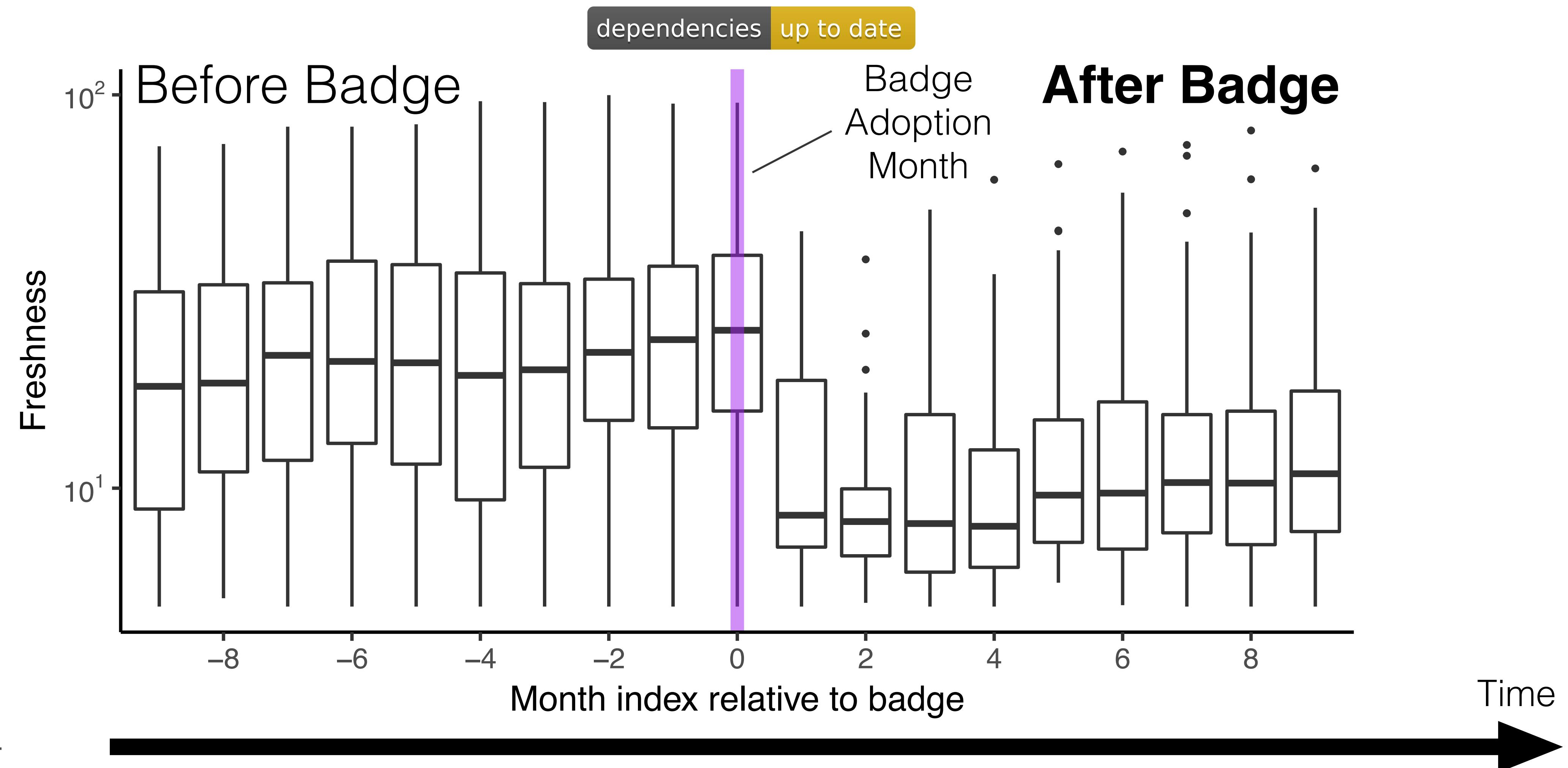
## Step 3: Time Series Analysis

# Signals of fresh dependencies



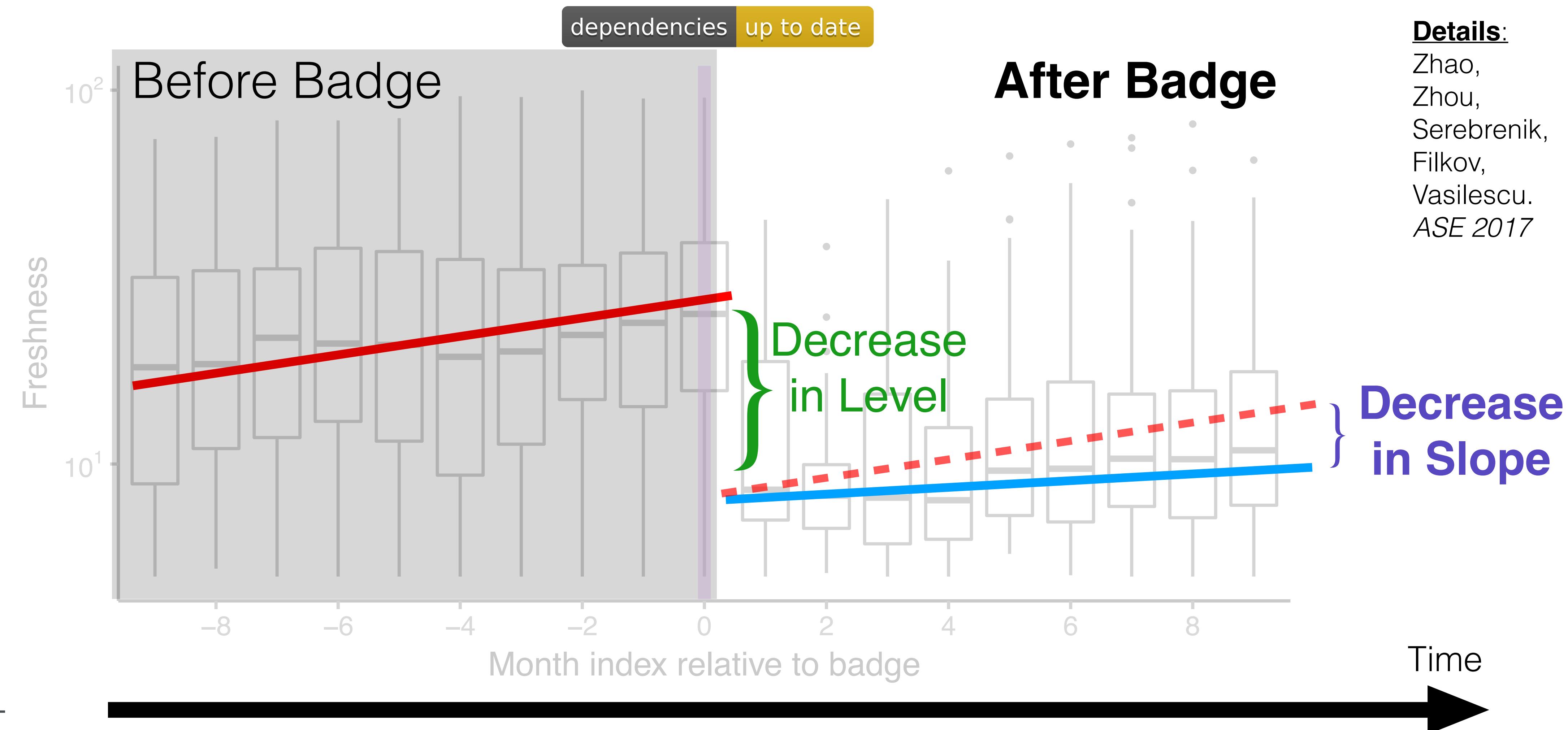
## Step 3: Time Series Analysis

# Signals of fresh dependencies



## Step 3: Time Series Analysis

# Signals of fresh dependencies



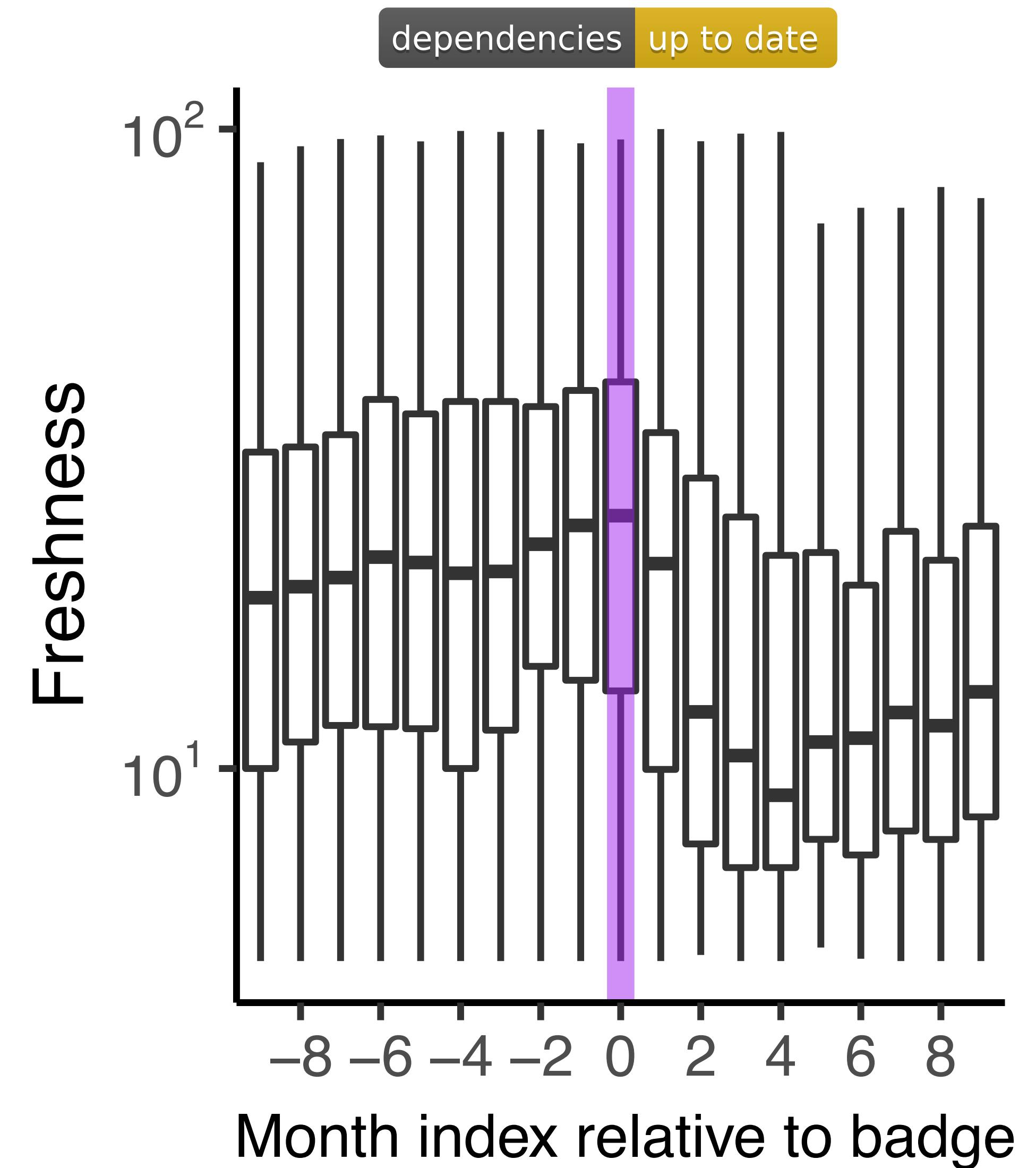
## Step 3: Time Series Analysis

# Signals of fresh dependencies

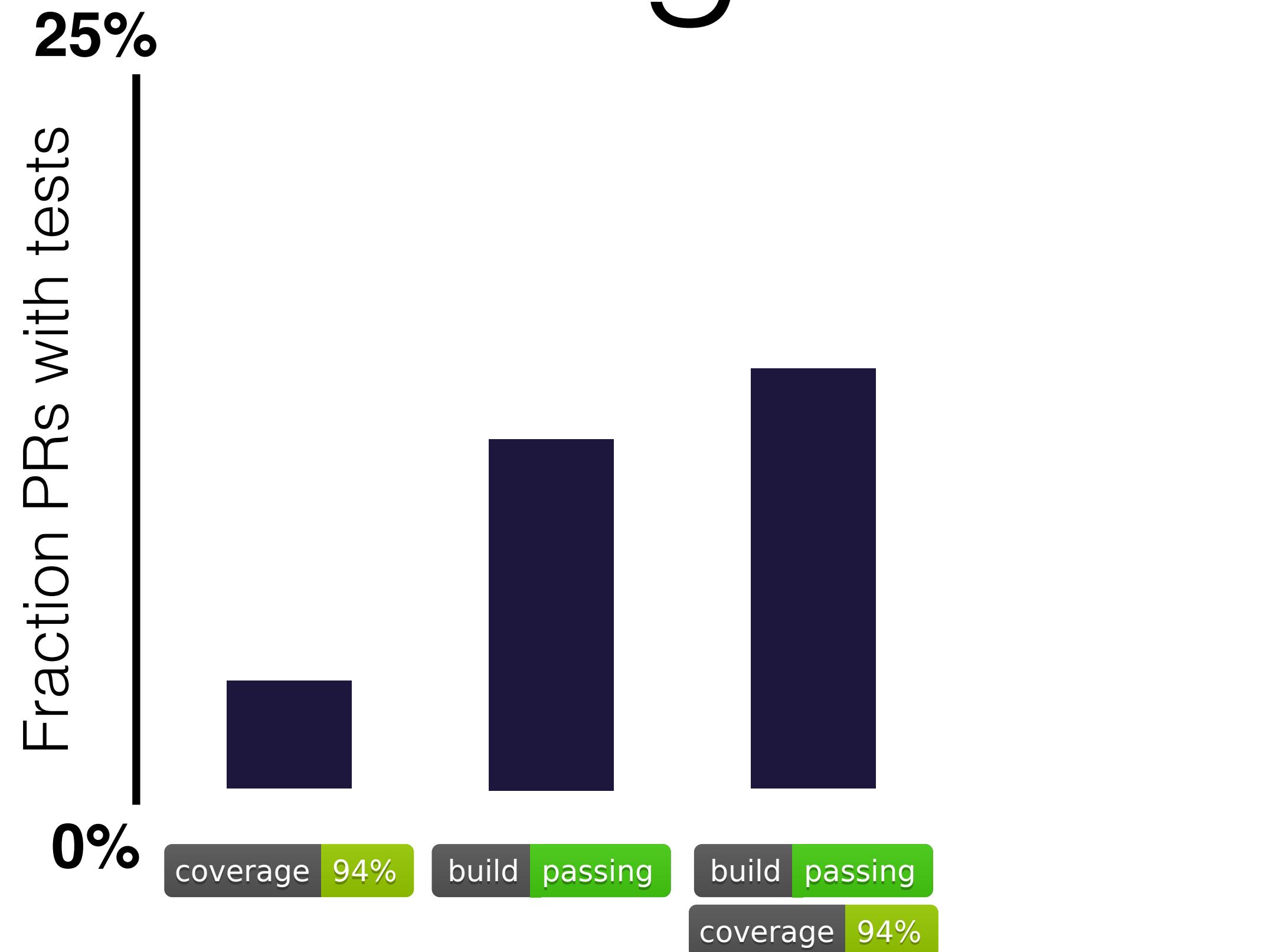


- **Based on survey:** The adoption of dependency management badges correlates with fresher dependencies
- **Freshness metric:** *lower* is better
  - (More up-to-date deps.)

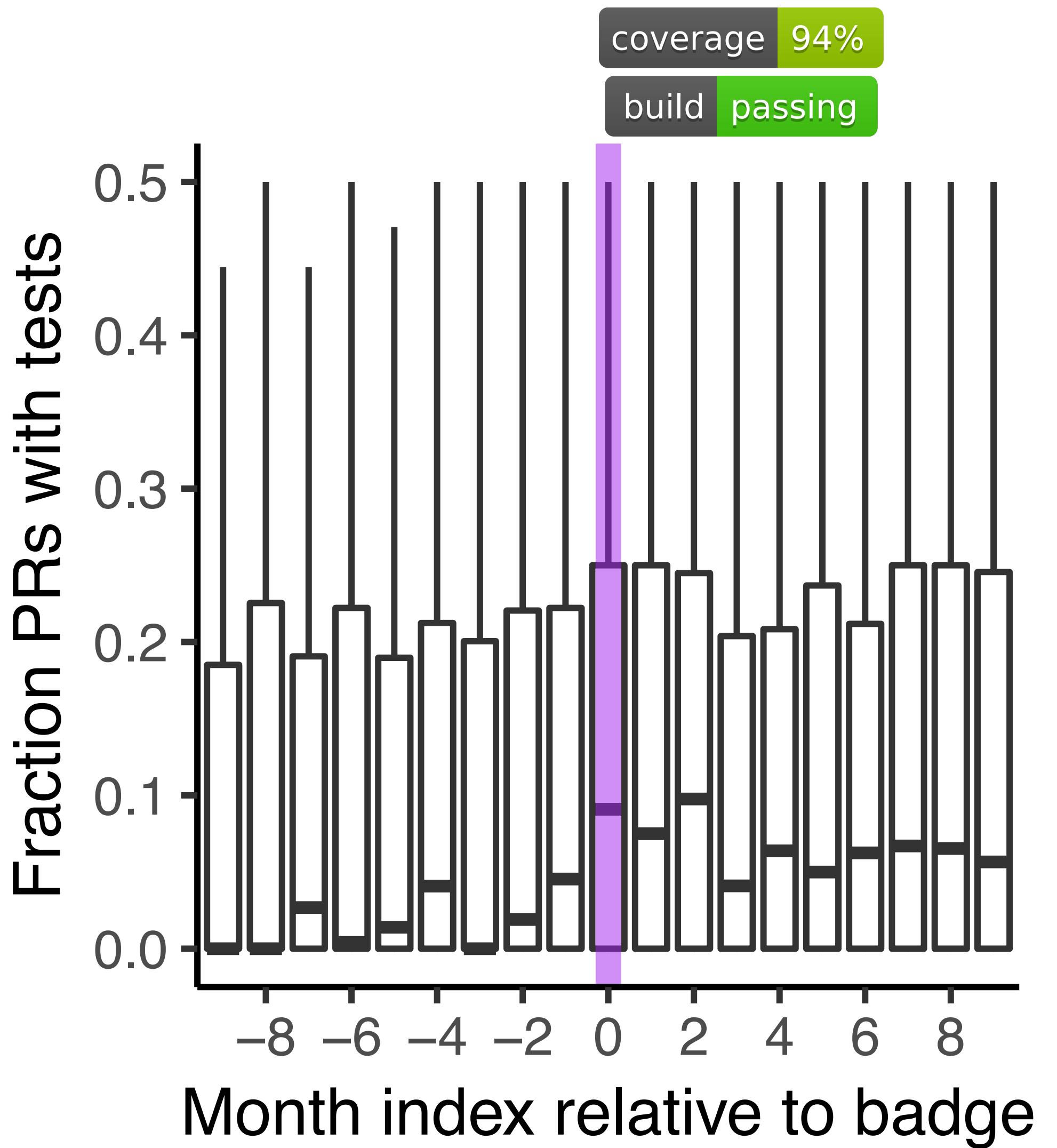
**Result:** Dep. badges indicate *improved dep. management practices*



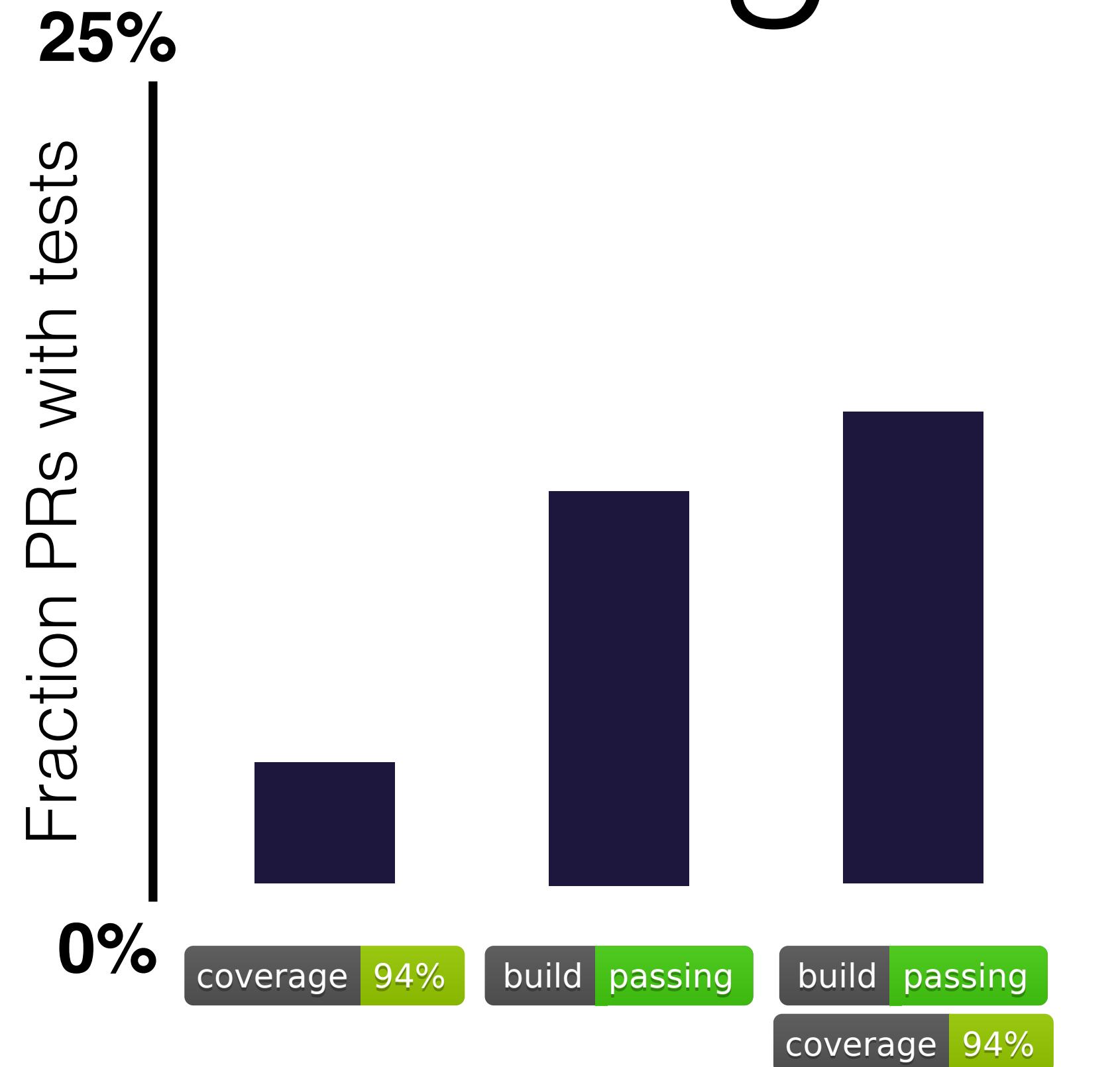
# Signals of PR quality



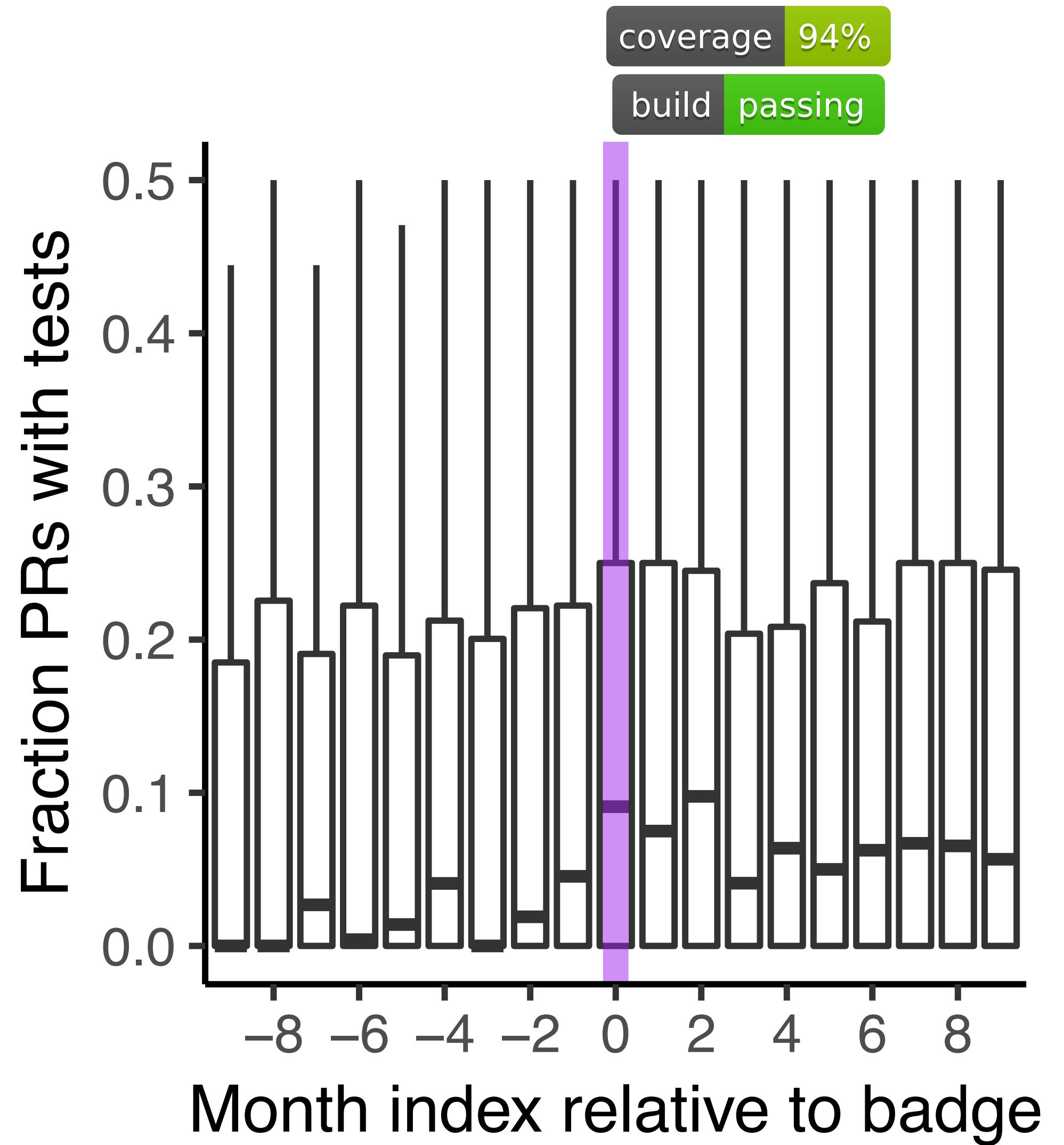
**Result:** Build status+code coverage badges indicate *more tests in PRs*



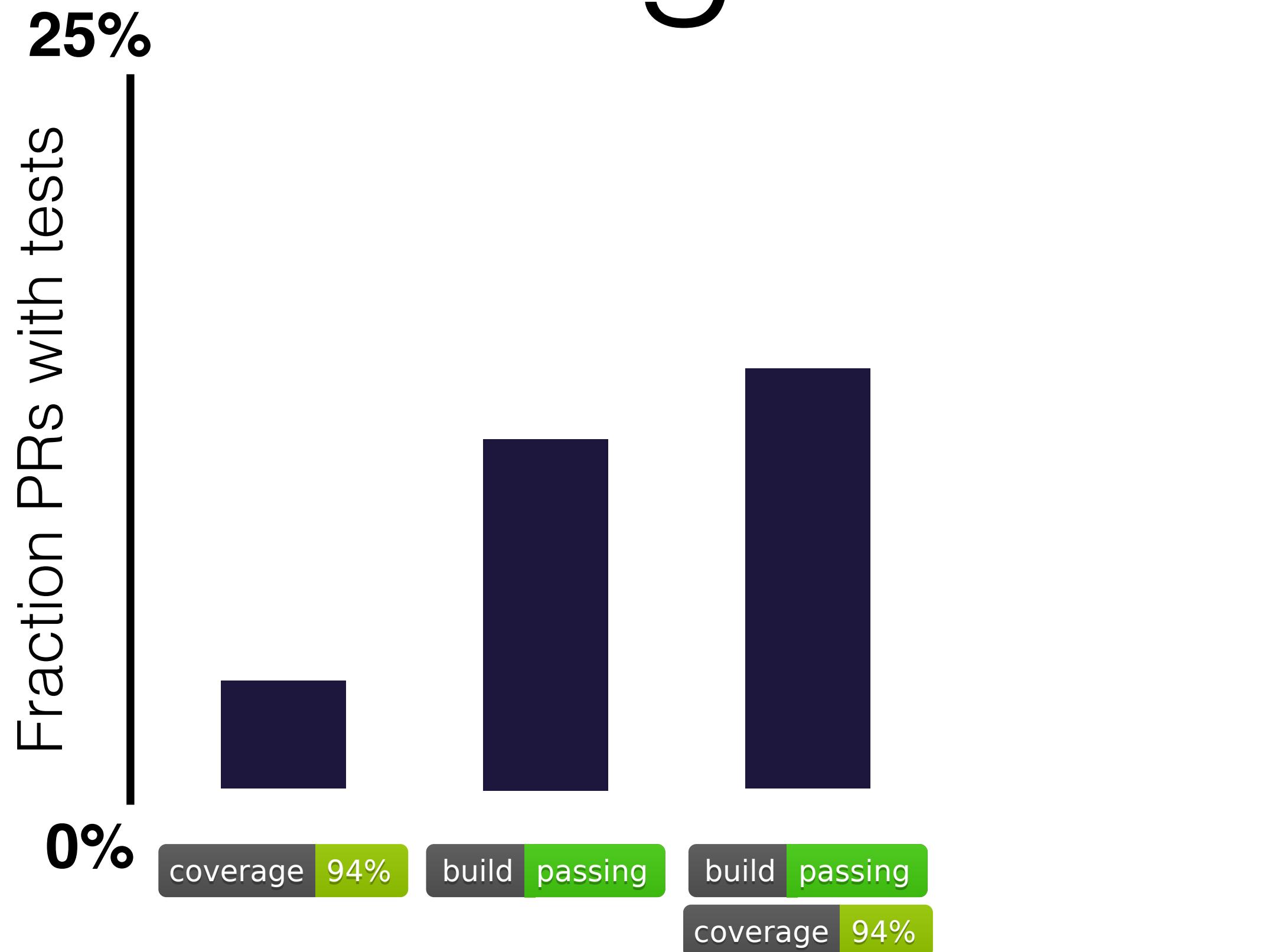
# Signals of PR quality



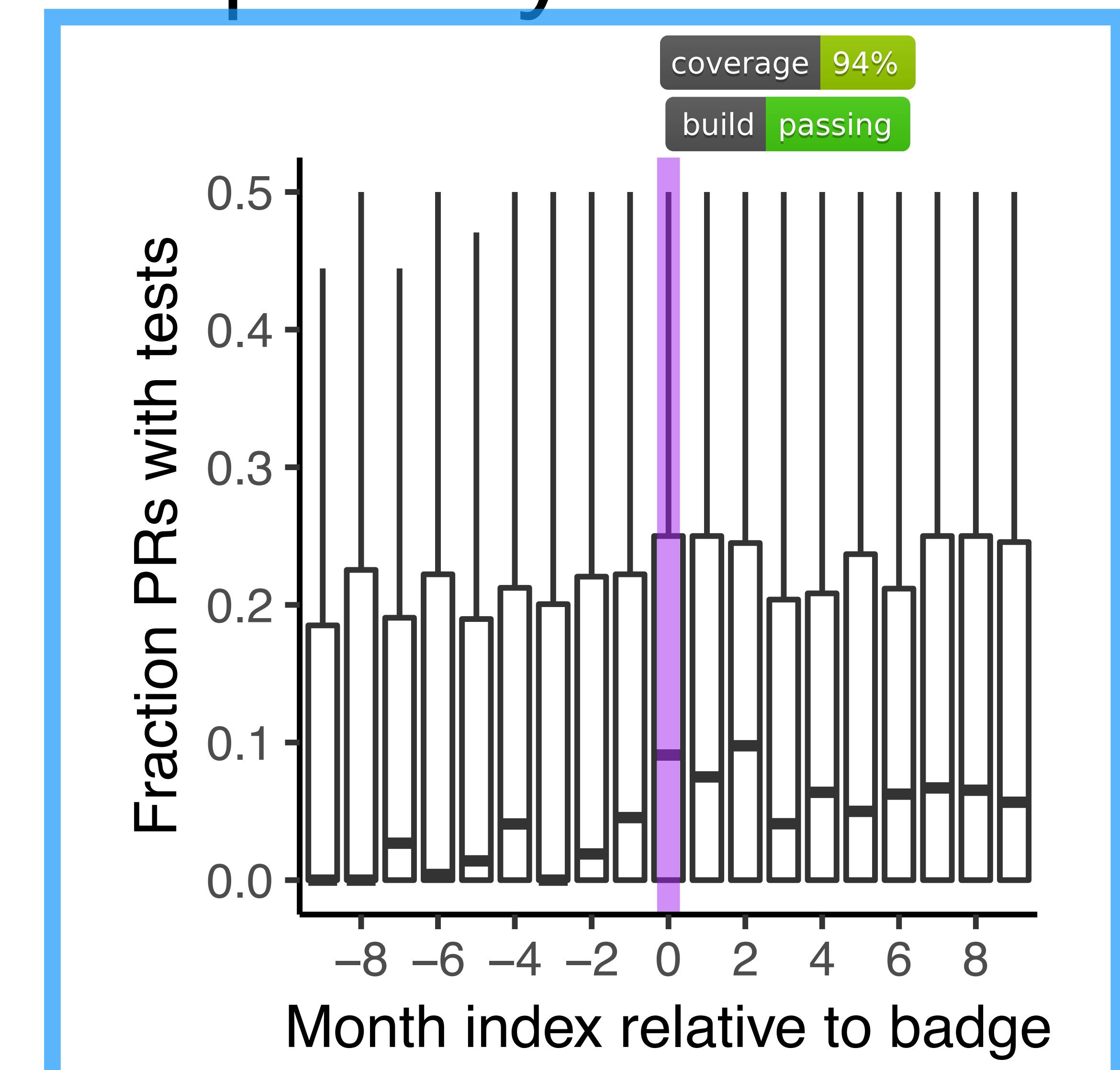
**Result:** Build status+code coverage badges indicate *more tests in PRs*



# Signals of PR quality



**Result:** Build status+code coverage badges indicate *more tests in PRs*

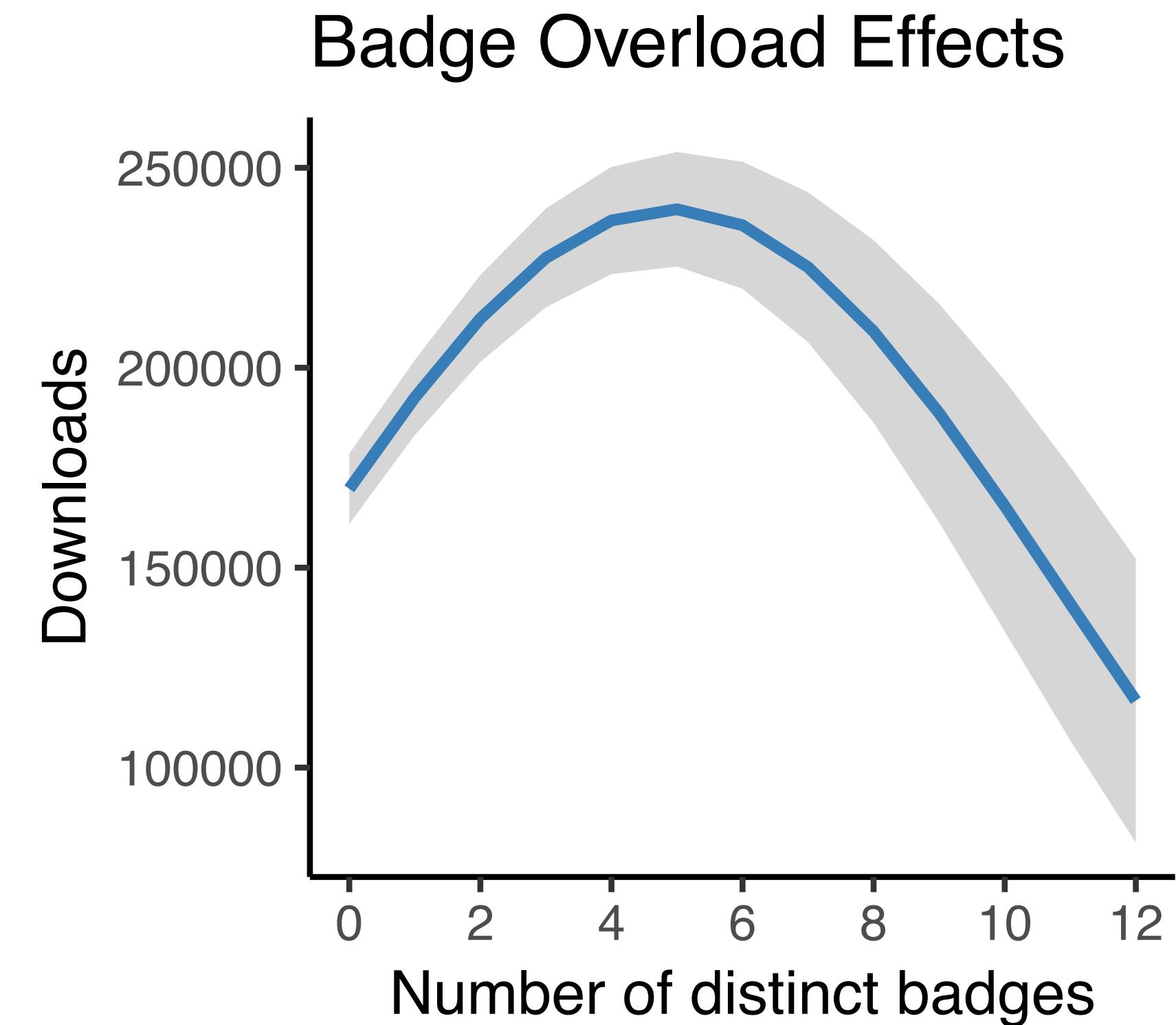


# Too many badges?

- **Based on survey:**

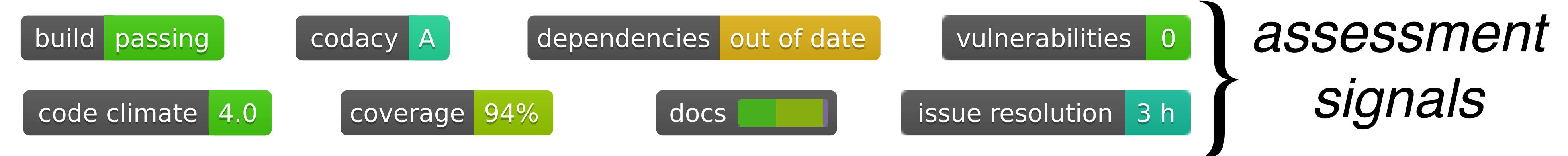
*“People tend to overwhelm visitors with too many (useless) badges, thus creating a contra effect and loosing the initial purpose of having useful information.”*

**Result:** Attractiveness wears off beyond five badges



# Take-aways

## Badges with underlying analyses:

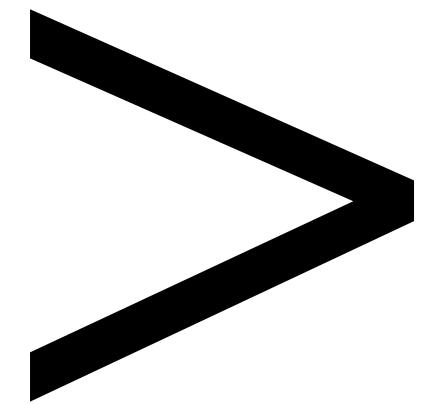


are **stronger predictors** than badges that merely state intentions or provide links:



# Take-aways

When possible,  
design or choose the badge that takes the **most work**:

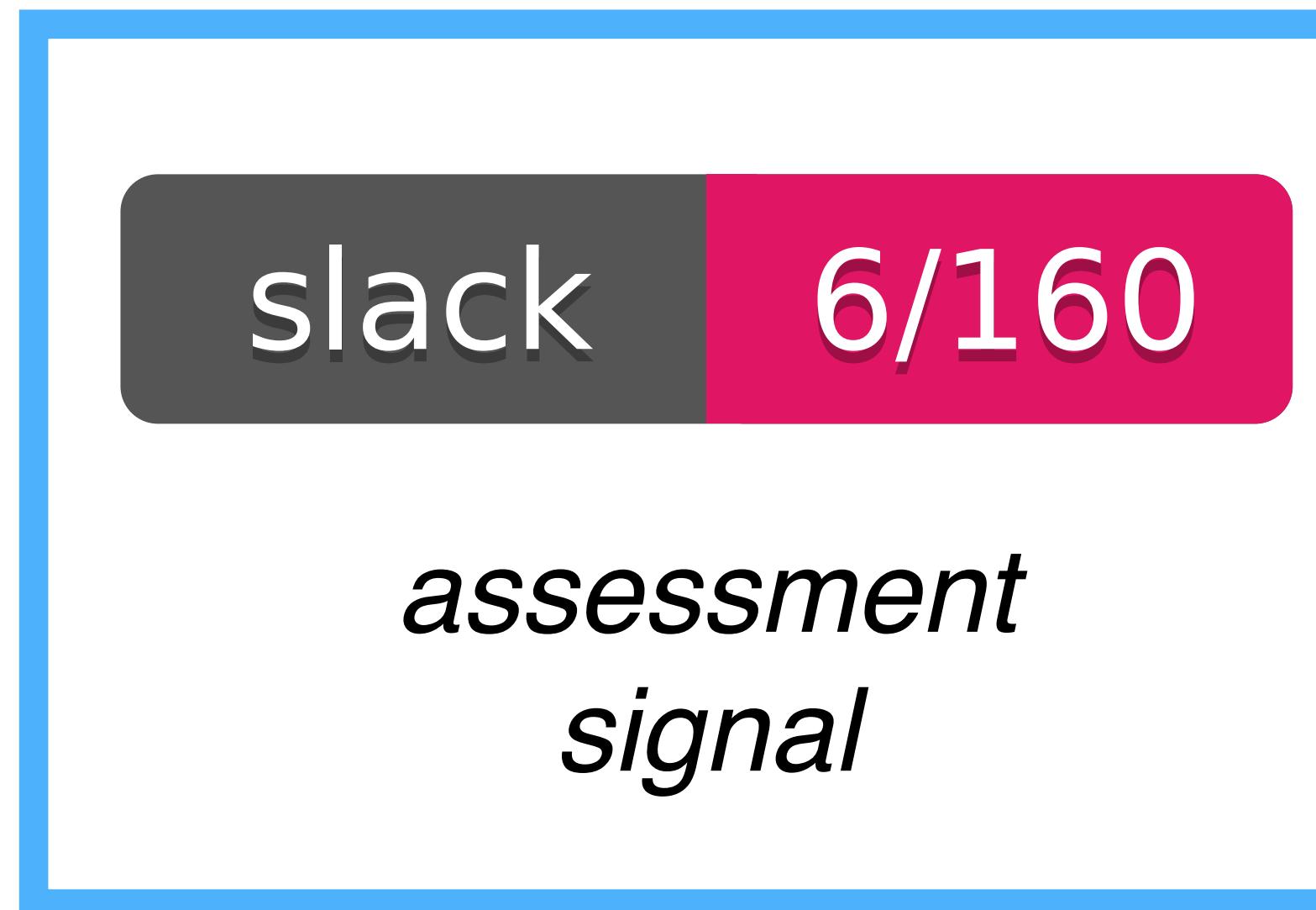


*assessment  
signal*

*conventional  
signal*

# Take-aways

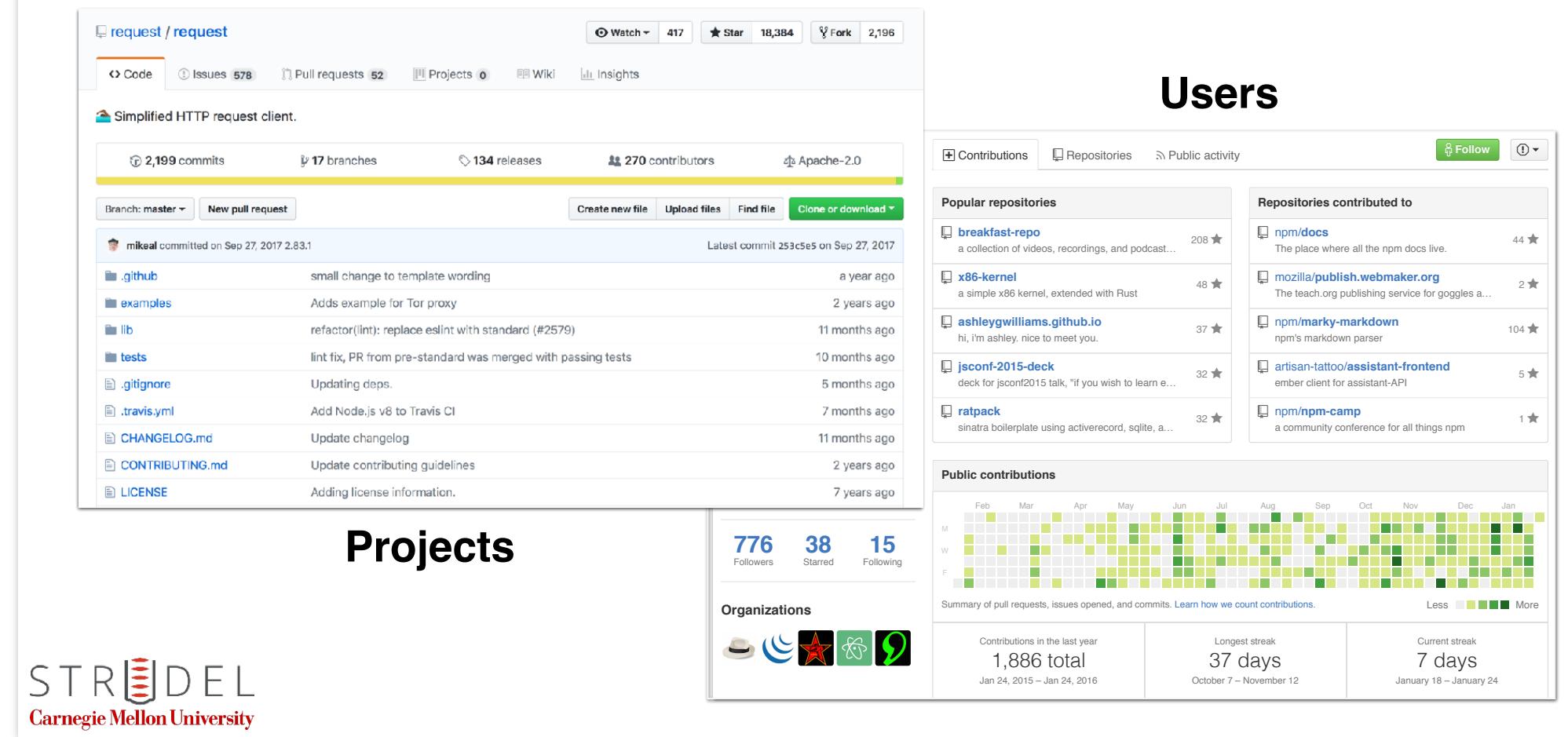
When possible,  
design or choose the badge that takes the **most work**:



# Adding Sparkle to Social Coding

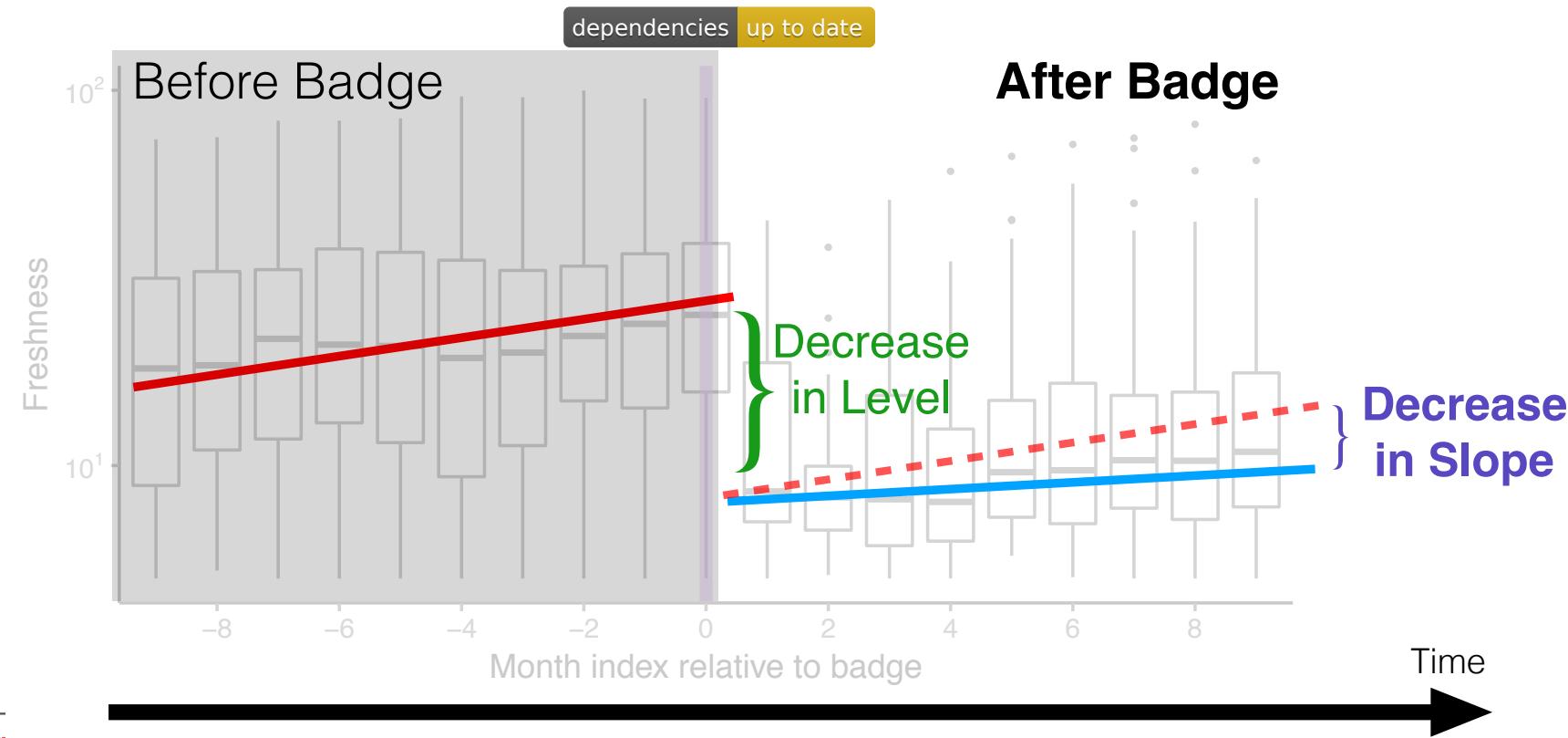
badges mostly reliable  
<https://cmustrudel.github.io/badges>

## Key features: Transparency & signaling

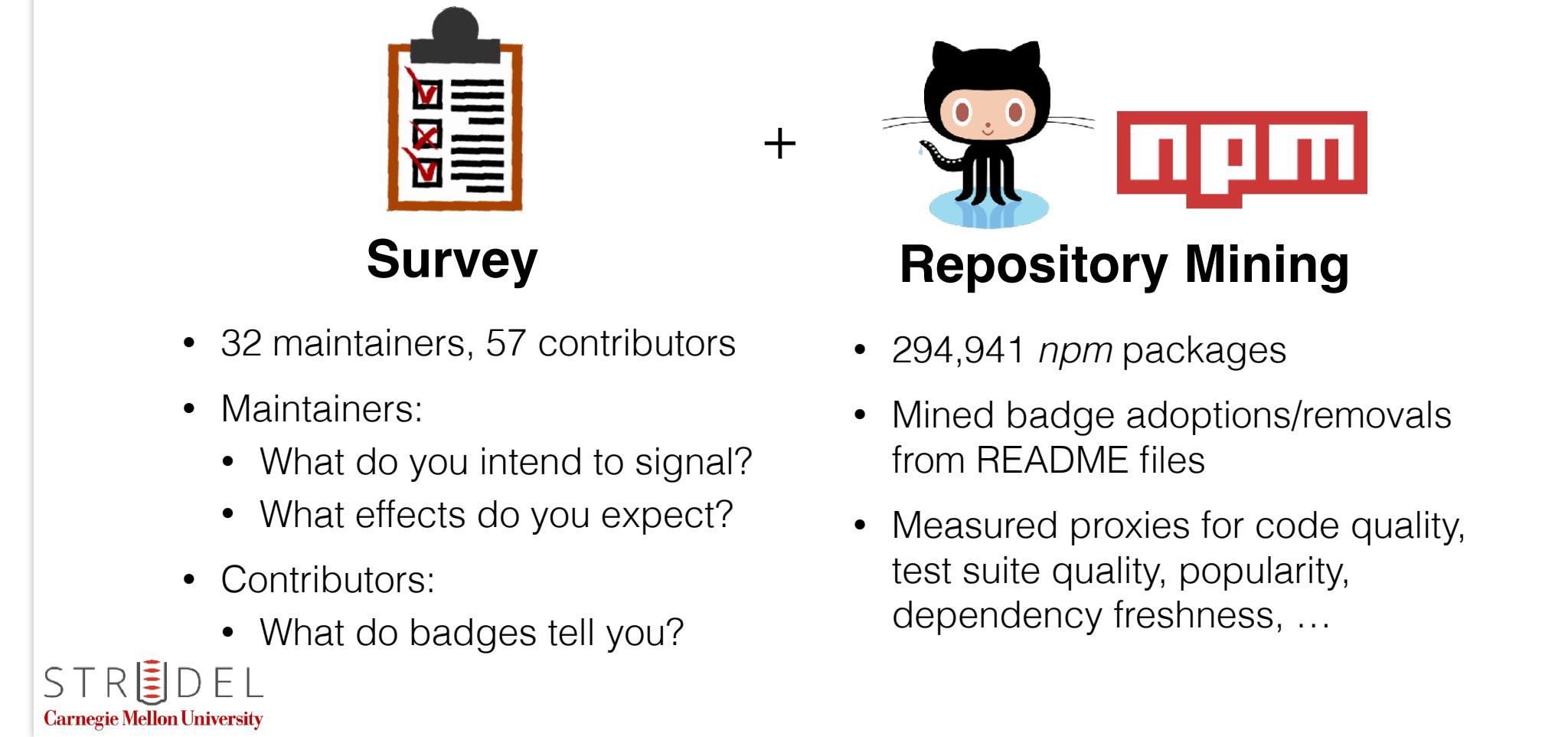


The screenshot shows the STRUDEL GitHub profile. It includes a list of recent commits, a projects section with 776 followers, 38 starred repositories, and 15 following repositories. Below this is a users section showing contributions, repositories contributed to, and public contributions over time.

## Step 2: Time Series Analysis Signals of fresh dependencies



## Mixed methods study



The diagram illustrates a mixed methods study combining a survey, repository mining, and npm analysis. It features icons for a clipboard (Survey), a GitHub cat (Repository Mining), and the npm logo. The survey section lists 32 maintainers and 57 contributors. The repository mining section lists 294,941 npm packages. The npm section details badge adoptions/removals from README files and provides proxies for code quality, test suite quality, popularity, and dependency freshness.

## Take-aways

When possible,  
design or choose the badge that takes the **most work**:

