Pro-cyclic Faculty Hiring

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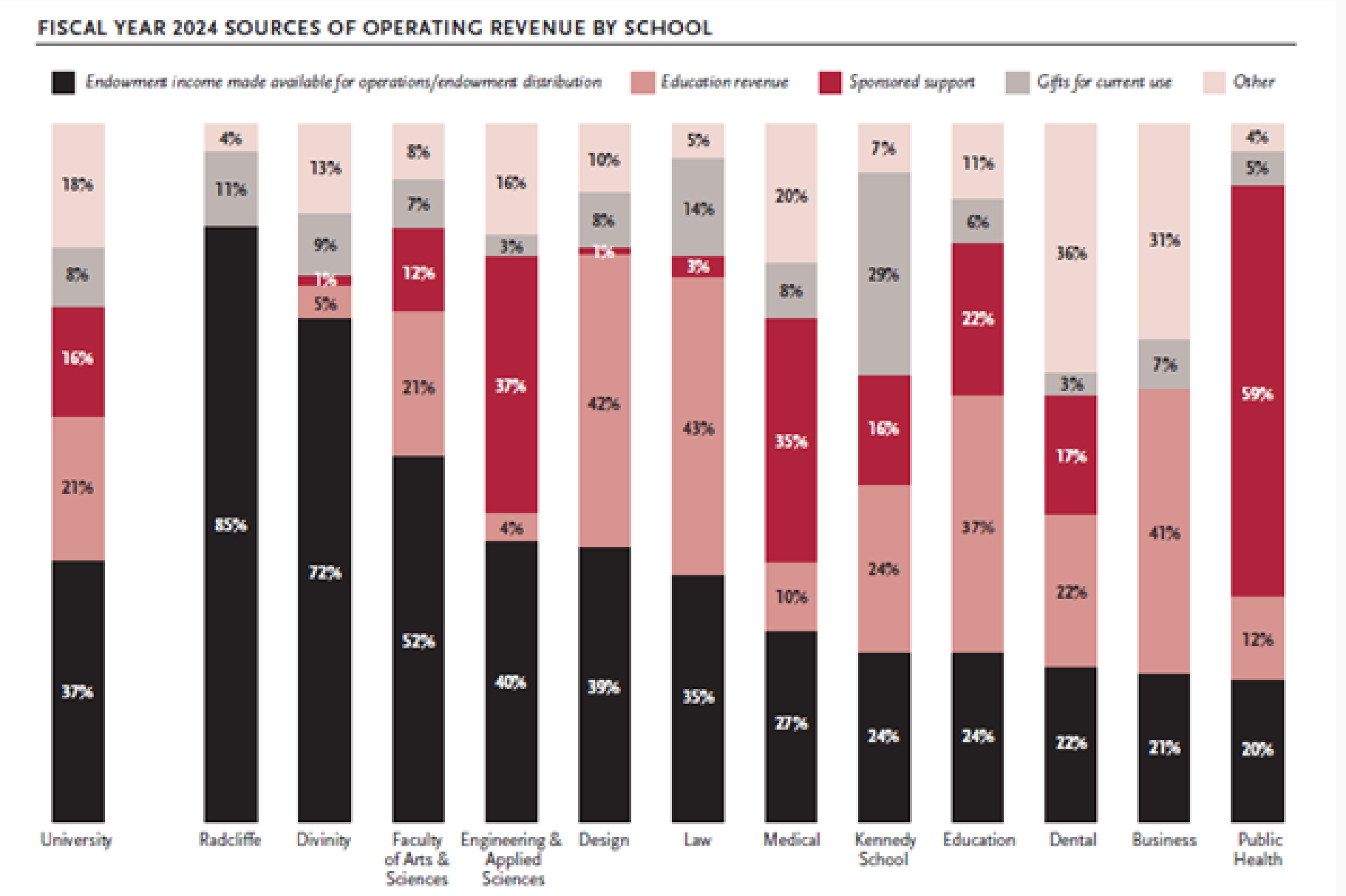
Housekeeping

- Clarification questions anytime
- Discussion questions at the end
- Feedback on *everything* very welcome
- zpu@hbs.edu

Take-aways

- University budget depends on endowment
- Faculty hiring depends on budget
- Everything fluctuates
- In theory, alternative hiring schemes could improve university outcome
- In practice, no evidence yet

Motivation: University Endowment



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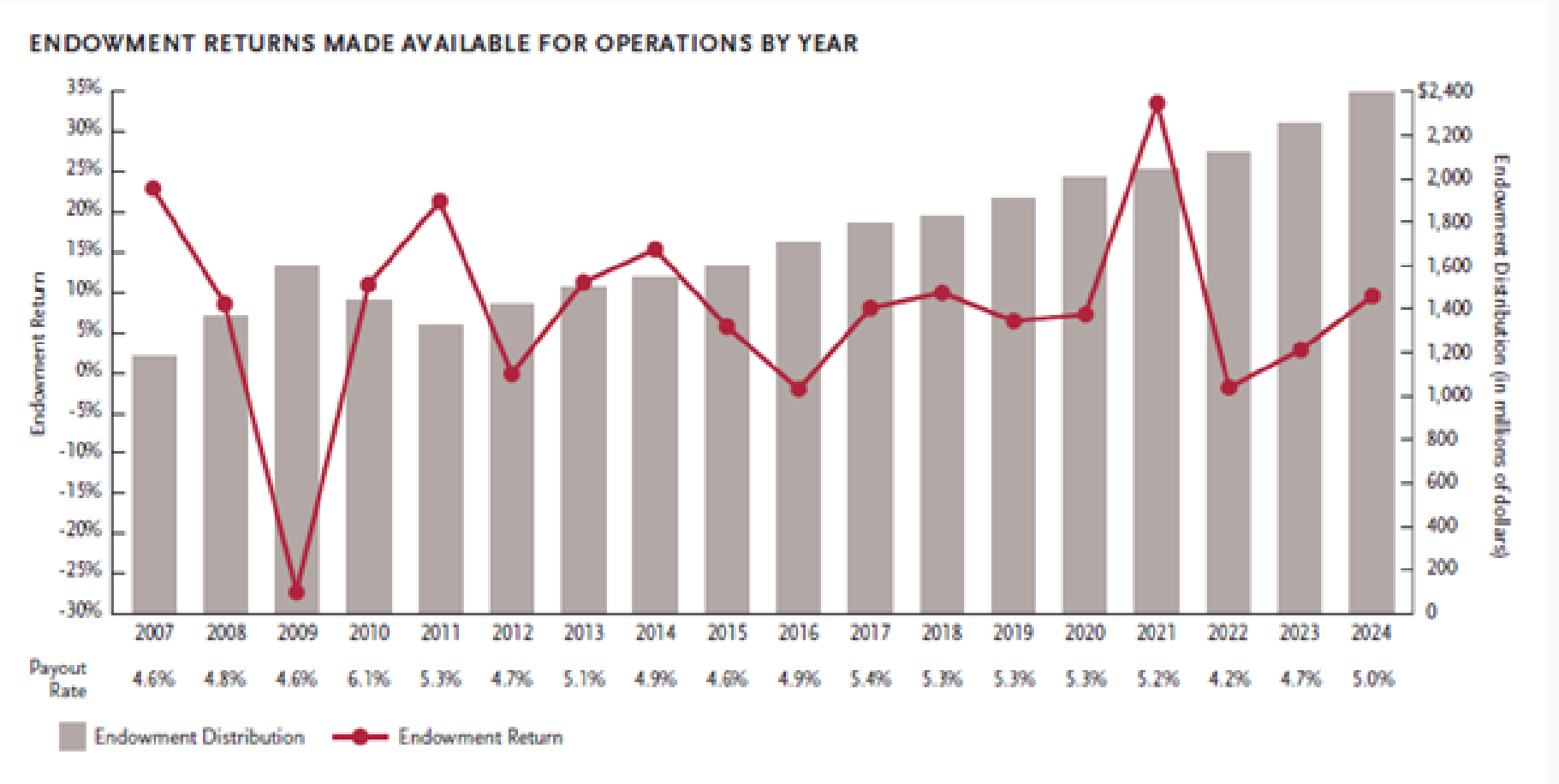

Motivation: Endowment Management

- Simple Proportional Spending Rule
  - “yearly endowment payout as a fixed proportion of current endowment based on payout rate *a*, which is often .05 for non-profit organizations. (Avery et al. 2025)
  - $S_t = \alpha X_t$
- Hybrid Spending Rule
  - “The payout ... is equal to 80% of the prior year’s spending plus 20% of the long-term spending rate applied to the previous year’s beginning endowment market value, with the sum adjusted for inflation.”
  - $S_t = \beta(\alpha X_{t-1}) + (1 - \beta)S_{t-1}$

Motivation: Endowment Management

- Simple Proportional Spending Rule
- Hybrid Spending Rule
- Henry Hansmann (1990):
  - “Moreover, the spending rules currently popular among universities ... are **directly inconsistent with** a policy of using the endowment as a financial buffer.”
  - “Such a rule commits an institution to using its operating budget as a buffer to absorb shocks to the market value of its endowment, rather than vice versa.”
- Endowment allocations at top private universities have become increasingly similar (Goetzmann and Oster 2015)

Motivation: Faculty Hiring

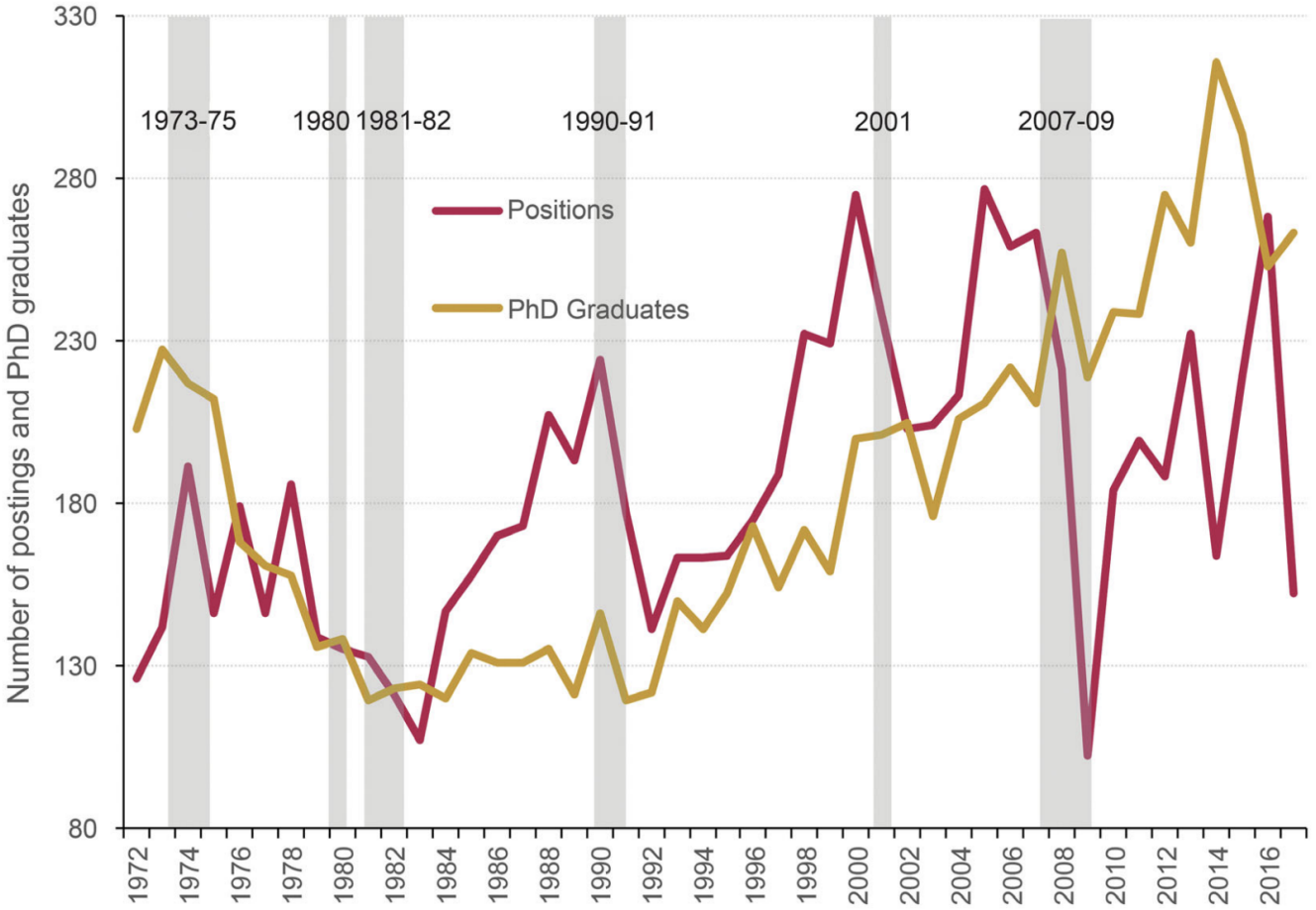

Figure 5 *Tenure-track and teaching position postings in U.S. geography departments, PhD graduates and economic recessions, 1972–2017. Note*: *Recessionary periods are indicated in gray. Data for positions from* AAG Newsletter, *Jobs in Geography section (1972–2012) and AAG Office (2013–2017); for PhD graduations from* 2017–2018 AAG Guide to Geography Programs in the Americas*; and for recessions from* National Bureau of Economic Research *(see* https://www.nber.org/research/data/us-business-cycle-expansions-and-contractions*).*

Source: Coomes et al. (2022)

Research Question

- Does endowment performance affect faculty hiring?
- Can universities improve welfare by deviating from the current budget rule and pro-cyclic hiring?

This Paper

- Models theoretically the gains from counterfactual hiring, ties them to supply and demand side characteristics of the faculty labor market
- Proposes structural identification strategies
- Applies to a real-world dataset of faculty hires

Institutional Background

Faculty Hiring Process

- Begins at the department level
  - faculty identify staffing needs
  - department chair submits request to dean for authorization to hire
- Deans and provosts make the final decision on whether to authorize and fund the position based on budget.
- Department forms a search committee
  - posts job advertisements in fall
  - evaluates applications and conducts interviews
  - ranks candidates and makes offers in spring
  - final approval by the dean

Financial Determinants of Faculty Hiring

TO: All students (who think they are) on the 2016/17 job market
FROM: Claudia Goldin and Lawrence F. Katz, Placement Directors
Date: July 25, 2016
RE: Frequently Asked Questions about the Job Market (#1)

(*Note*: FAQ #1 covers the Job Market from now to early November. Later memos will cover applications, the meetings, and the interviews.)

3. The Market for Economists

Q: How good will the market for economists be this year?

A: The academic market tends to depend on recent years' capital market returns and state fiscal positions. The private sector tends to depend on recent years' capital market returns and expected economic growth. We expect a good market, but we will know more when the JOE ads appear. On the whole, you should not worry about the macroeconomic state of the academic job market. Economists generally do very well, particularly Harvard PhDs. Your paper, presentation and skills are more important than aggregate market conditions.

- Anecdotal / narrative evidence + scant quantitative evidence
  - Brown et al. (2014): causal evidence for a negative effect of negative endowment shocks on tenure-system headcount among universities with endowment size that is close to the historical endowment size when the president joined.

Theoretical framework on gains from alternative hiring schemes

Set up

- Consider faculty hiring as a two-period problem for a department with a count-metric fixed hiring quota $b_i \in \mathbb{N}$ to allocate over two years $(s_{i,1} s_{i,2}) \in \mathbb{N}_+^2$.
  - Departments are ranked $i \in \{1, \ldots, I\}$, where $i = 1$ is the most prestigious.
  - Each year, J job market candidates (JMCs) arrive.
- Productivity is innate: the j-th most productive candidate has relative productivity $\theta(j) = -\gamma j$, where $\gamma \geq 0$ controls the rate of productivity decline across JMCs.
- Departments hire sequentially by rank.

Departments' Problem

- Each department i chooses $(s_{i,1}, s_{i,2})$ under the constraint of $s_{i,1} + s_{i,2} \leq b_i$ to maximize its *hiring outcome* V, defined as the total (across years) productivity of its hires:

$$V(s_{i,1}, s_{i,2}; i) = \sum_{t=1}^{2} \sum_{k=1}^{s_{i,t}} \theta \left(j_{i,t} + k - 1 \right)$$

where $j_{i,t}$ is the starting position of candidates available to i in year t. Note that $j_{i,t}$ is determined by the number of hires at all other departments $\{i' : i' < i, i' \in \mathbb{N}_+\}$ ranked higher than i.

Hiring outcomes under different hiring schemes

- Compare the hiring outcomes from two different hiring schemes: a smoothed hiring where $s_{i,1} = s_{i,2} = b_i/2$ versus an unsmoothed hiring scheme of $(s_{i,1} s_{i,2}) = (b_i, 0)$.
- For smoothed hiring scheme, the hiring outcome is

$$\tilde{V}_i = \sum_{t=1}^{2} \sum_{k=1}^{b_i/2} \left[-\gamma \left(j_{i,t} + k - 1 \right) \right]$$

- For unsmoothed hiring, the outcome is

$$V_i' = \sum_{k=1}^{s_{i,1}} \theta \left(j_{i,1} + k - 1 \right) = \sum_{k=1}^{b_i} \left[-\gamma \left(j_{i,1} + k - 1 \right) \right]$$

- The difference simplifies to

$$\tilde{V}_i - V_i' = \gamma \frac{b_i}{2} \left(j_{i,1} - j_{i,2} + \frac{b_i}{2} \right)$$

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$$\tilde{V}_i - V_i' = \gamma \frac{b_i}{2}\left(j_{i,1} - j_{i,2} + \frac{b_i}{2}\right)$$

- Three observations follow:
  1. When JMCs have homogeneous productivity ($\gamma = 0$), both hiring schemes produce the same outcome.
  2. Gains from smoothing depends on the time-relative market demand for JMCs, $(j_{i,1} - j_{i,2})$ and could be negative if smoothing shifts hiring to the year with high market demand.
  3. Suppose other departments' demand is constant across years, smoothing improves hiring outcome when JMCs have heterogeneous productivity ($\gamma > 0$).

Numerical examples

- Example 1: The top department $i = 1$ faces $\gamma = 0.05$, $b_1 = 4$. Its gains from smoothing is $0.05 \times 4/2 \times (0 - 0 + 4/2) = 0.2$.
- Example 2: The top department $i = 1$ faces $\gamma = 0.005$, $b_1 = 4$. Its gains from smoothing is $0.005 \times 4/2 \times (0 - 0 + 4/2) = 0.02$.
- Example 3: A non-top department i' faces $\gamma = 0.05$, $b_{i'} = 2$. More prestigious departments hire 10 JMCs every year. The gains for i' from smoothing is
  $0.05 \times 2/2 \times (10 - 10 + 2/2) = 0.05$
- Example 4: A non-top department i' faces $\gamma = 0.05$, $b_{i'} = 2$. More prestigious departments hire 5 JMCs in the first year and 16 in the second year. The gains for i' from smoothing is $0.05 \times 2/2 \times (5 - 16 + 1) = -0.5$. Note that smoothing worsens the hiring outcome by increasing hiring in years when competitor departments hire more.

(Structural) Identification

Set up and notations

- Unless otherwise noted, the norms notations $||\cdot||$ denote L1 norms, and $\vec{e}_i$ denotes a standard basis vector where the i-th component is 1 and all others are 0.
- Consider again a set of departments indexed by : $i \in \{1, \ldots, I\}$, each ranked $r(i)$ with $r(i) \equiv 1$ denoting the highest ranking. Suppose that there are years $t \in \{1, \ldots, T\}$. Suppose that department i in year t has budget to hire s_{it} faculty. Then we can summarize the slots using a $I \times T$ slot matrix $S = [\vec{s_1}, \ldots, \vec{s_T}]$, where $\vec{s_t}$ is a $I \times 1$ vector capturing the number of slots in each department in year t.
- Suppose $\vec{v_t}$ is a $I \times 1$ vector capturing hiring outcomes in each department in year t. One hiring outcome is simply the sum of each department-year's hires' productivity.
- Define an hiring outcome function $f : \mathbb{R}^I \to \mathbb{R}^I$ as a mapping from slots $\vec{s_t}$ to outcome $\vec{v_t}$.

Set up and notations

- Suppose each department's payoff is determined by an overall outcome defined as a convex combination of each year's output. Note that weights can be set to be non-uniform to counteract the secular increase in per-researcher productivity or ability. We assume for simplicity that all departments have the same weights $\vec{w} \in \mathbb{R}^T$. Then the $I \times 1$ vector $\vec{u} := V\vec{w}$ summarizes each department's payoff.
- Now we can define various policy-relevant objects of interest. For example:
  - $f(\vec{s_t} + \vec{e_i}) - f(\vec{s_t})$ is the marginal increase in outcome of adding 1 slot in department i in year t.
  - $[f(S') - f(S)]\vec{w}$ is the net payoff gain from an alternative allocation S' over S.

Given the weakly increasing property of $f(\cdot)$ we know adding slots always weakly improves outcome. However, in reality constraints

More Theory

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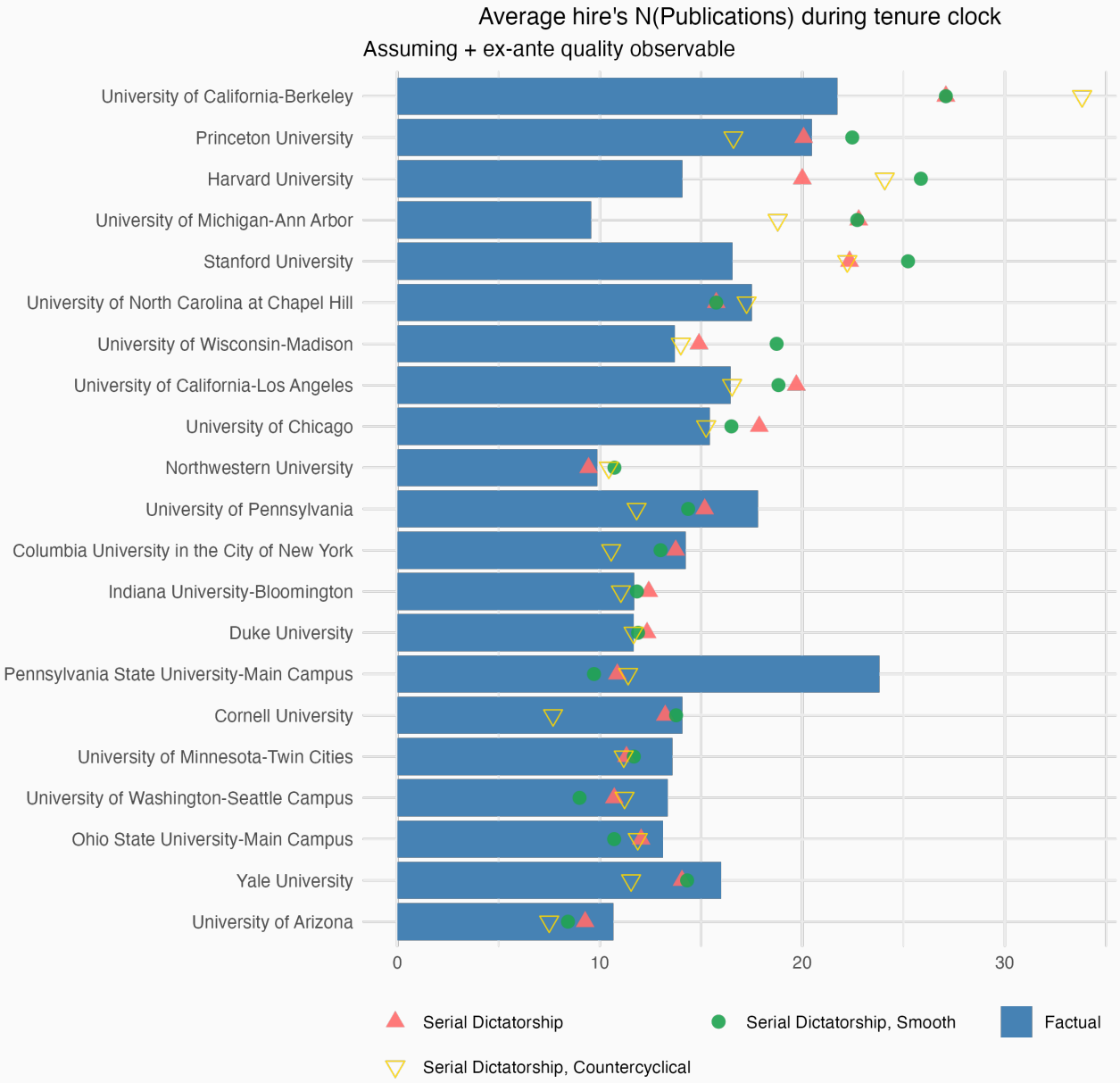
Empirics

Data

- Individual-level data on the universe of assistant professor hires at 21 top sociology departments in the U.S. from 1991 to 2017 compiled by Warren (2019)
- Publication data using OpenAlex

Estimation


Average hire's N(Publications) during tenure clock
Assuming + ex-ante quality observable
University of California-Berkeley
Princeton University
Harvard University
University of Michigan-Ann Arbor
Stanford University
University of North Carolina at Chapel Hill
University of Wisconsin-Madison
University of California-Los Angeles
University of Chicago
Northwestern University
University of Pennsylvania
Columbia University in the City of New York
Indiana University-Bloomington
Duke University
Pennsylvania State University-Main Campus
Cornell University
University of Minnesota-Twin Cities
University of Washington-Seattle Campus
Ohio State University-Main Campus
Yale University
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Serial Dictatorship
Serial Dictatorship, Smooth
Factual
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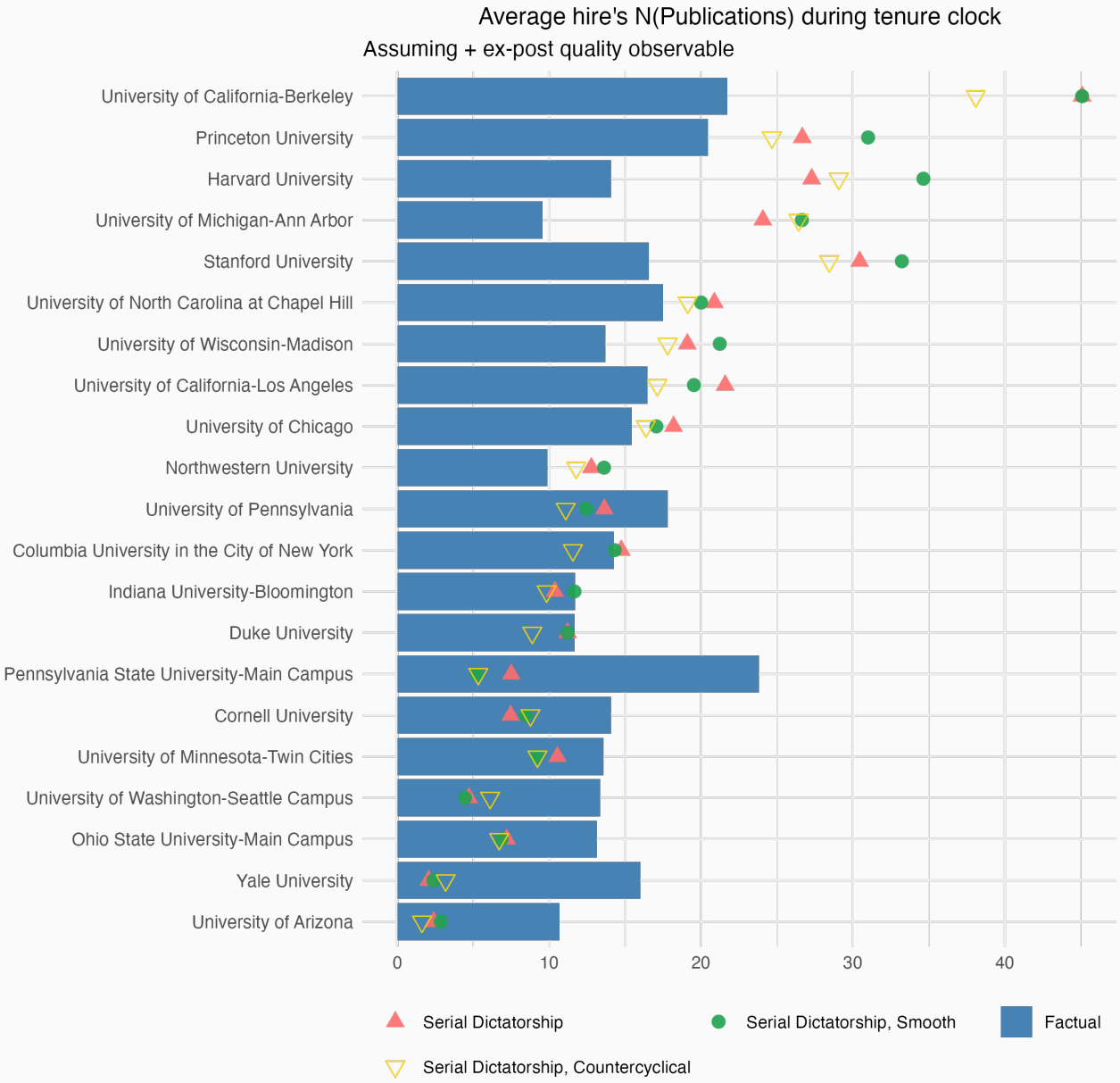
Estimation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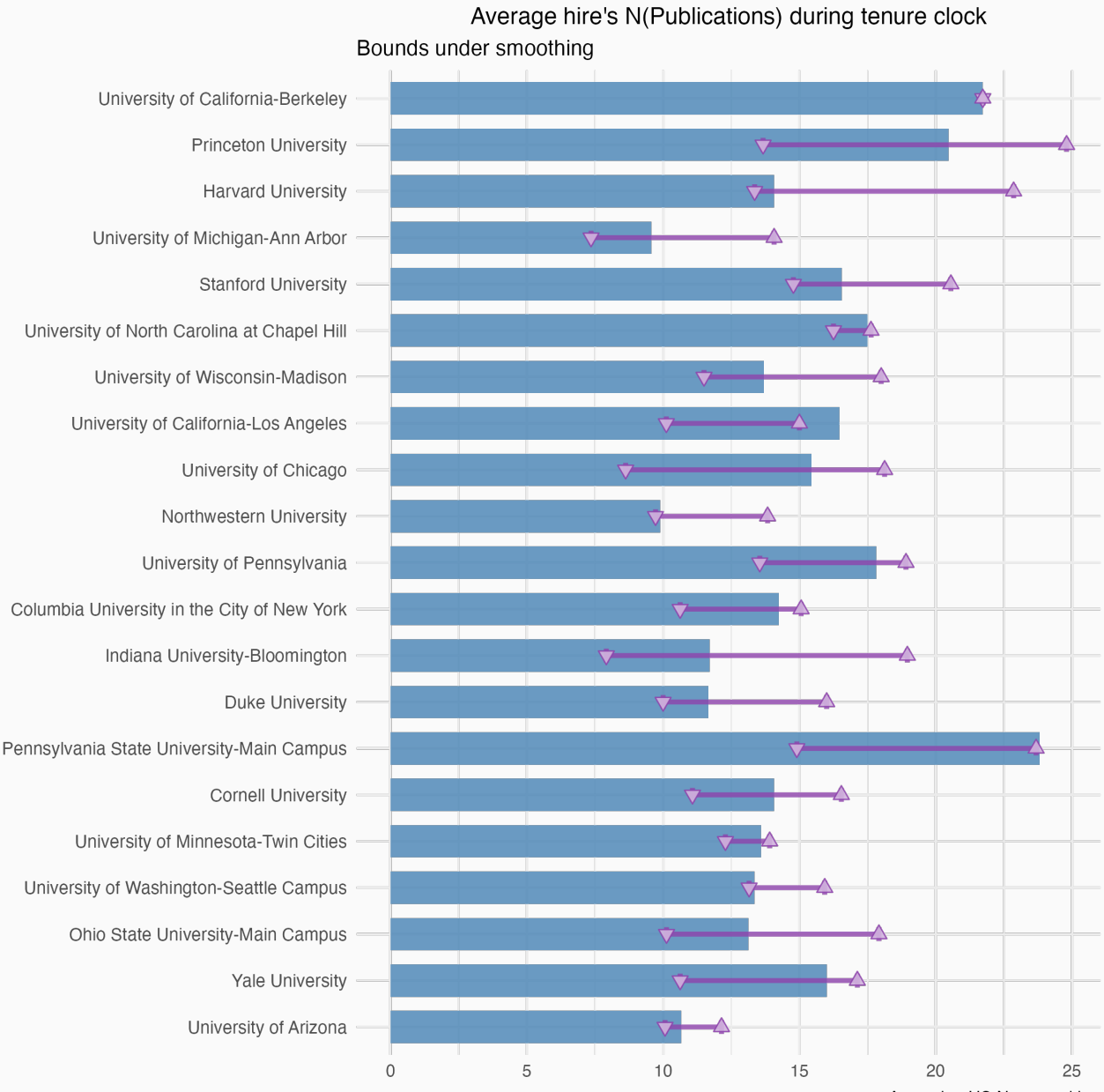
Estimation


Average hire's N(Publications) during tenure clock
Bounds under smoothing
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Ohio State University-Main Campus
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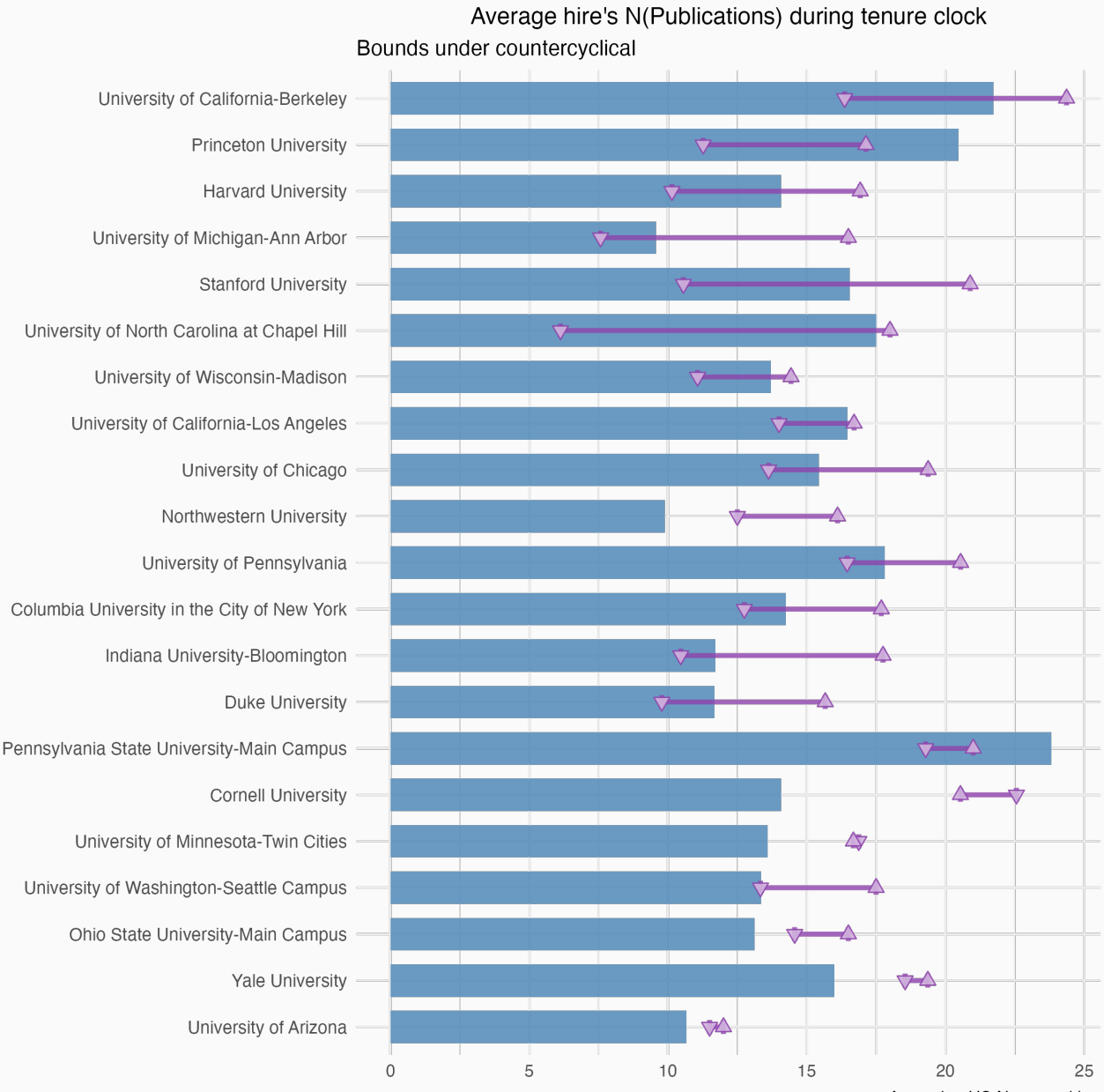
Estimation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Conclusion

Take-aways

- University budget depends on endowment
- Faculty hiring depends on budget
- Everything fluctuates
- In theory, alternative hiring schemes could improve university outcome
- In practice, no evidence yet
- (but possibly more to come)

Thank you!