

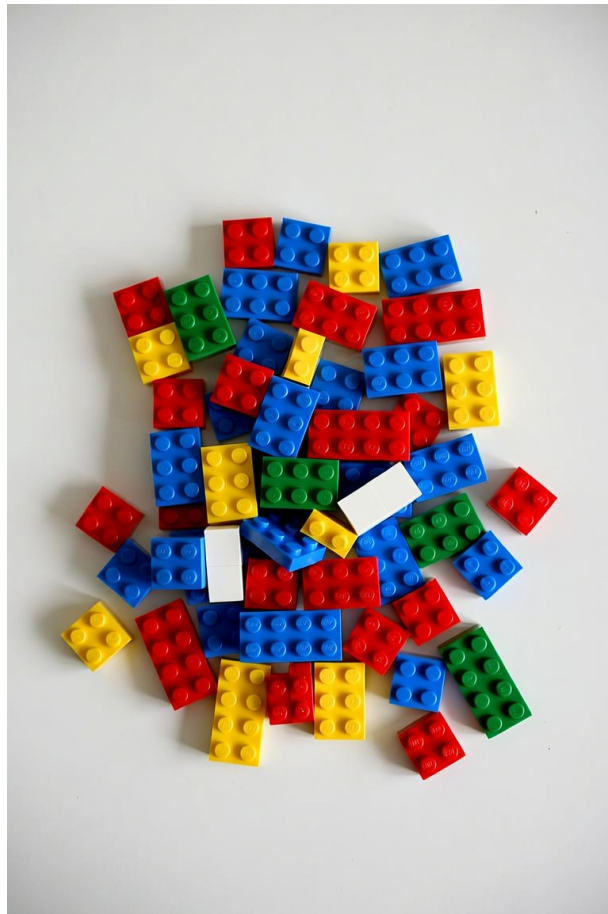
Regional Innovation Systems

1. Research university assortativity conditions the integration of regional innovation systems. *PLOS Complex Systems*, 2026 *
2. Institutional prestige, geographic embedding and competitiveness: A comparative analysis of research ecosystems in California and Texas. *Hum. & Soc. Sci. Communications*, 2026
3. University digital media co-occurrence networks reveal structure and dynamics of brand visibility in the attention economy. *Hum. & Soc. Sci. Communications*, 2025



* **Andrea Montaña Ramirez**

Well-posed problem (puzzle)



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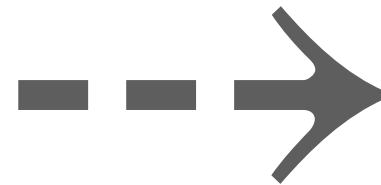
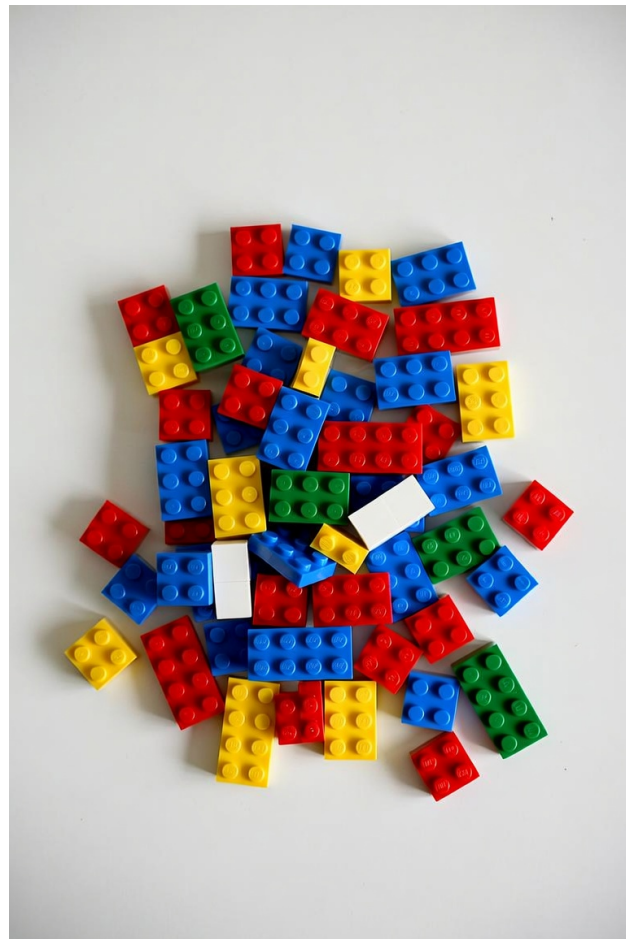
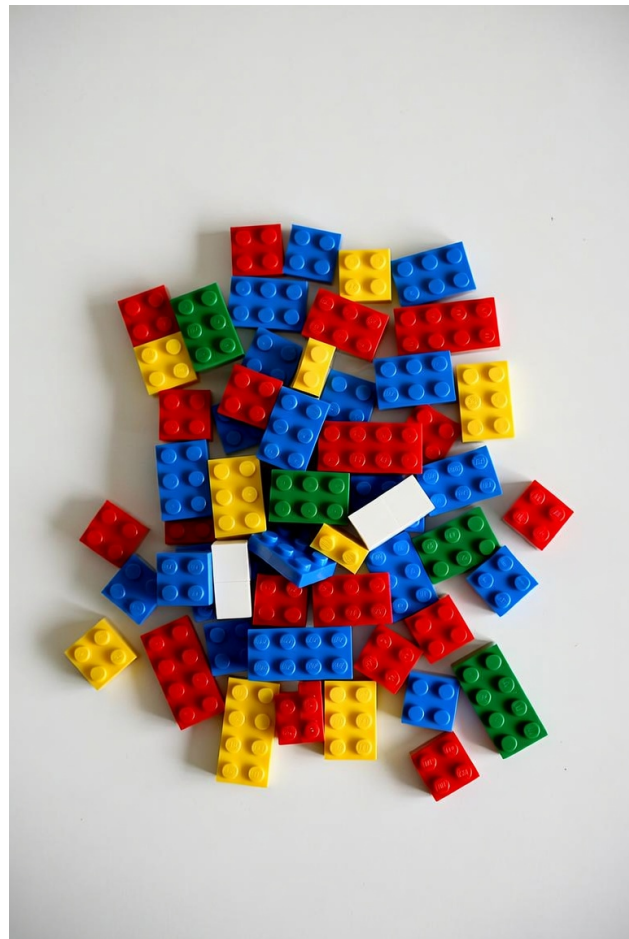


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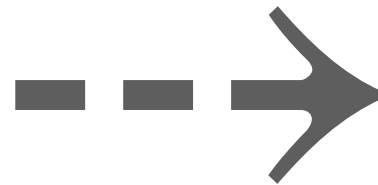


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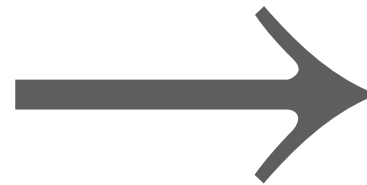
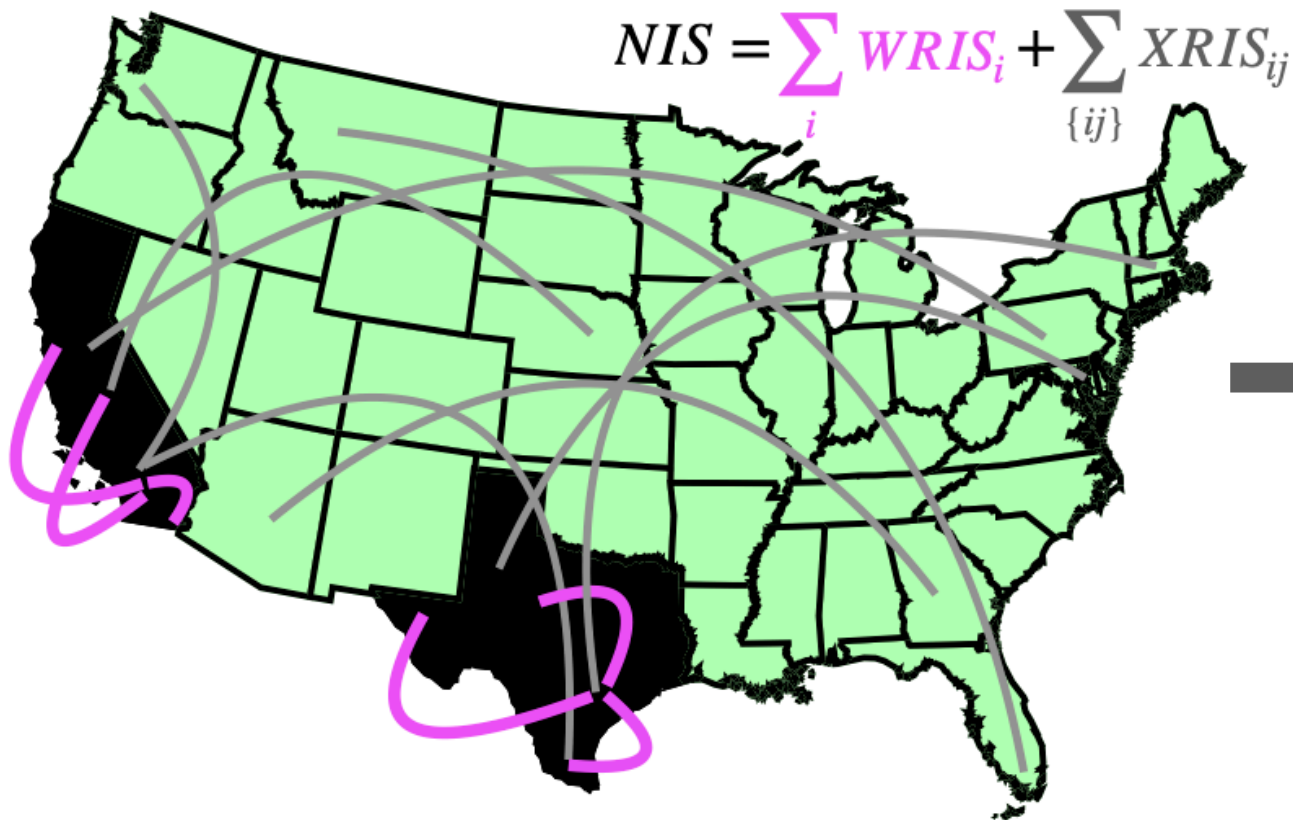
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🔥 Wicked problem (grand challenge) 🔥



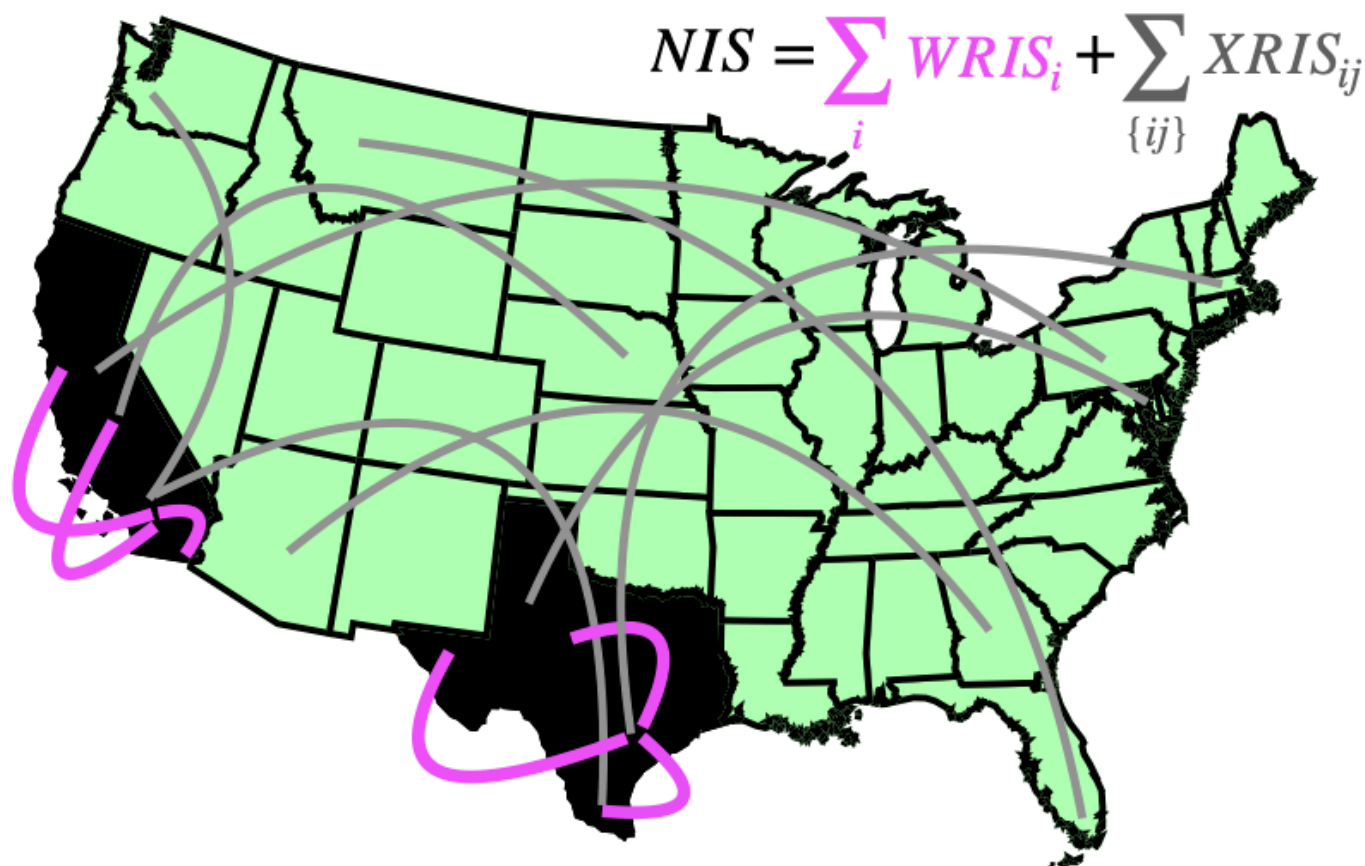
Regional Innovation Systems (RIS)

— through the lens of *Research University ecosystems* —

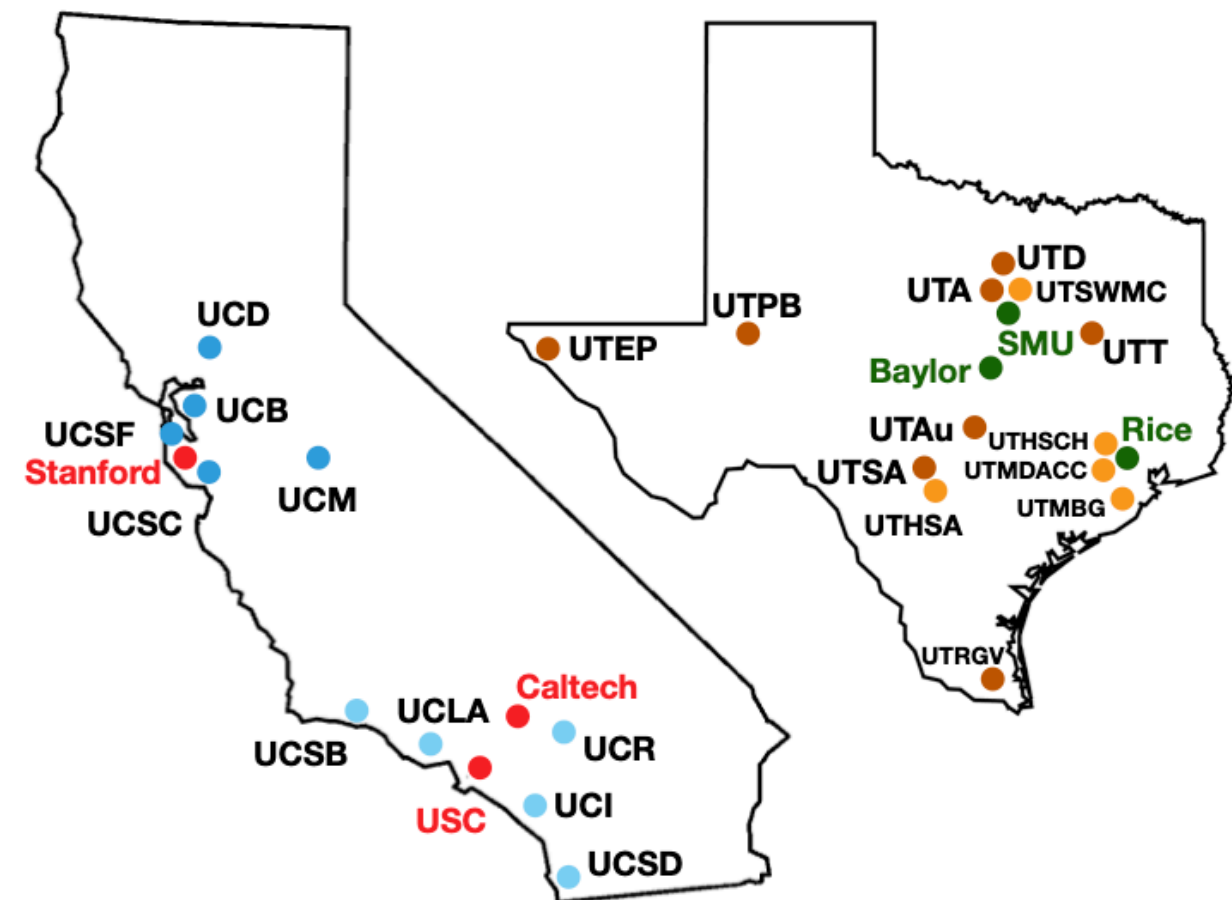
Research Question: • What is structure of institutional research co-production?
• How does a particular research university ecosystem configuration promote particular outcomes (**Structure → Function relationship**)

Method: Model the pairwise intensity of institutional research co-production (denoted by $J_{ij,t}$) between all pair of research universities that define a given RIS

National Innovation System (**NIS**)



— A case study of **CA & TX** —



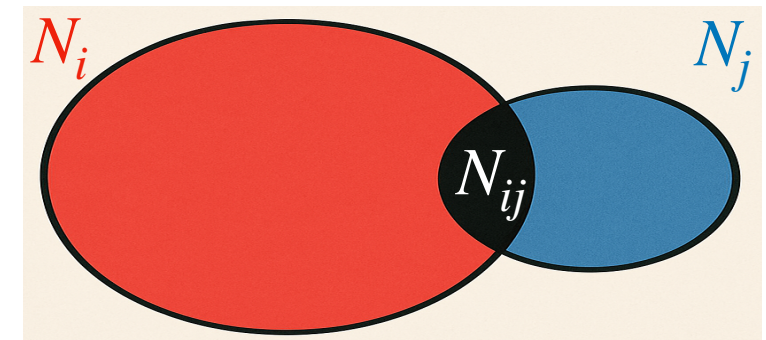
"The whole is greater than the sum of its parts" — widely attributed to Aristotle (384-322 B.C.E.)

— Dependent variable —

Institutional research co-production J_{ij} — a measure of pairwise integration.

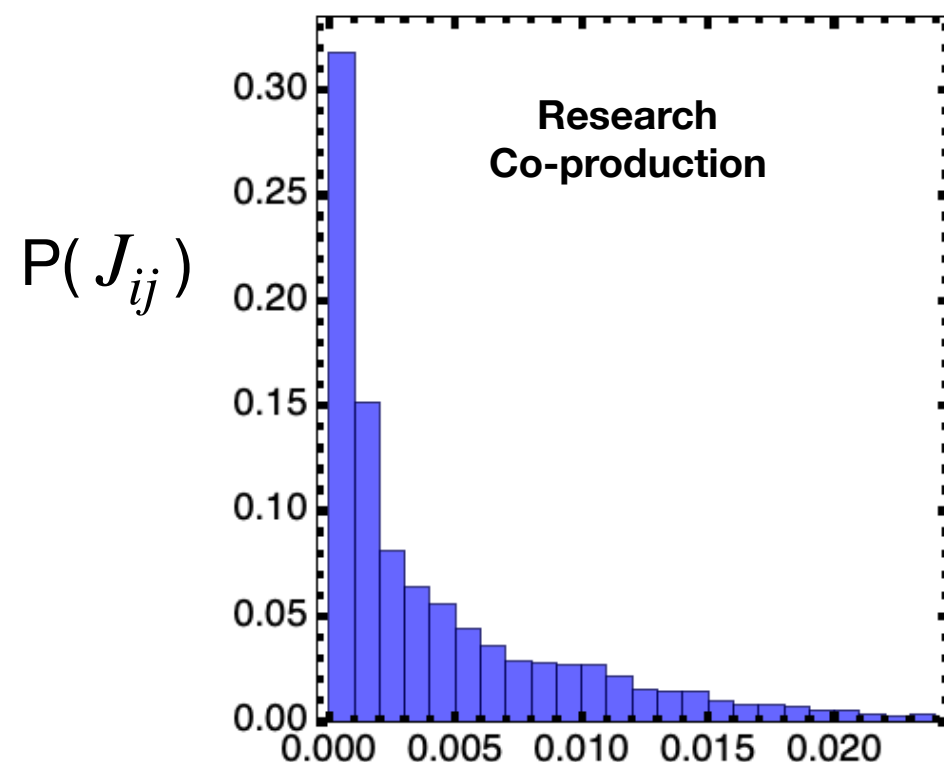
If $N_{i,t}$ is the nominal count of research articles produced by institution i in year t ,
then $J_{ij,t}$ is the fraction of total research featuring both institutions i and j

Jaccard similarity index = $J_{ij,t} = \frac{N_{ij,t}}{N_{i,t} + N_{j,t} - N_{ij,t}} \in [0,1]$
(intersection over union)



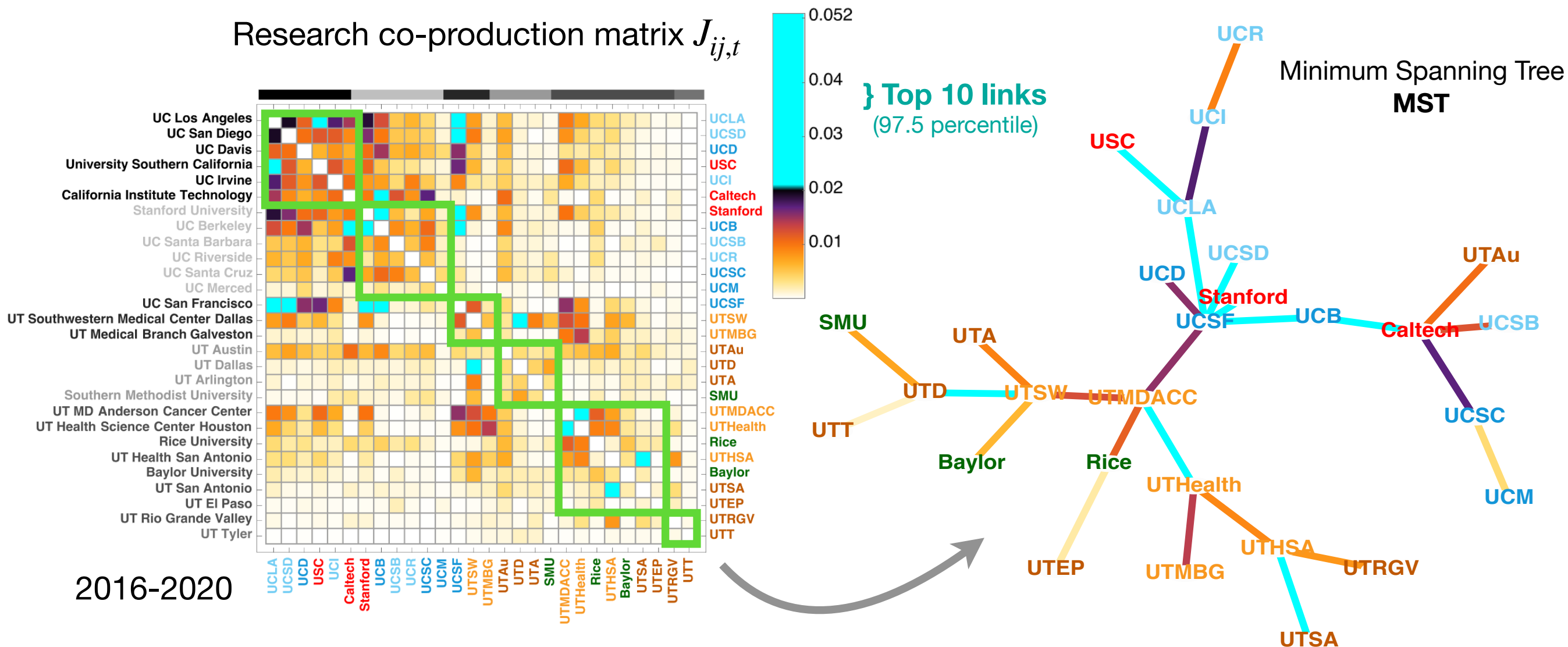
Descriptive Statistics

Variable	Average	Standard Deviation	Minimum	Median	Maximum
Research co-production, J_{ij}	0.0051	0.0072	0.0001	0.0023	0.0955



What is the structure of institutional research co-production?

— and role of boundaries (Institutional, Uni. System & State borders)? —



- **Community structure: within-region co-production**
 - counterexamples (eg UT Austin & UCSF; UT Austin & Caltech) indicate sorting by research area specialization & prestige
- **MST shows backbone structure:** highlights health science centers & RU with prominent medical schools as central hubs that mediate both within/across-RIS co-production via specialization-oriented alignment

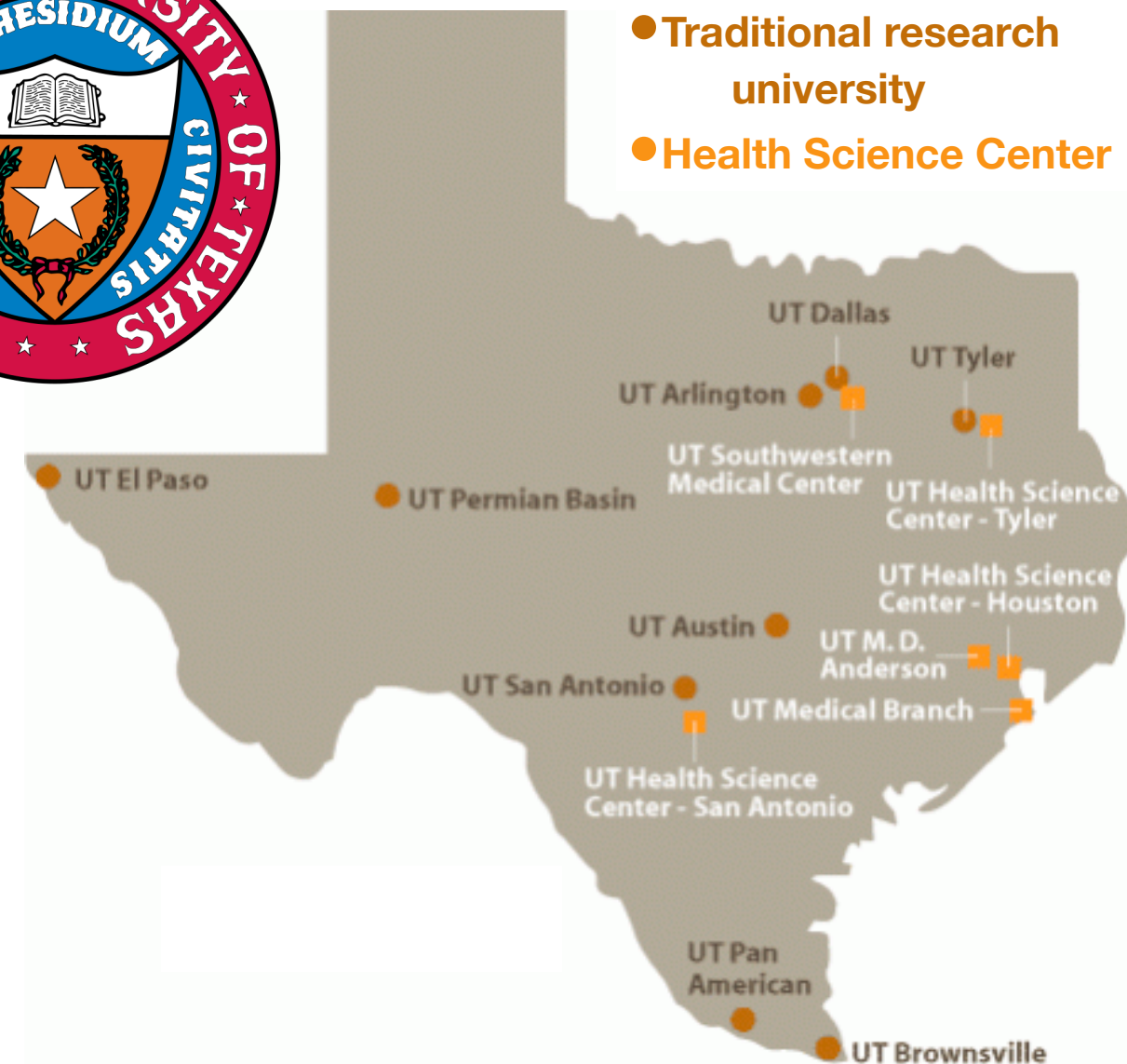
Factors promoting institutional co-production:

Multi-campus University Systems (MUS) — Institutional Homophily

$$MUS_{ij} = \begin{cases} 1 & \text{— if institutions } i \text{ and } j \text{ belong to same} \\ & \text{multi-campus university system (MUS)} \\ 0 & \text{— otherwise} \end{cases}$$



2024 operation budget: \$51 billion
 2022 research expend.: \$8 billion (16%)
www.universityofcalifornia.edu



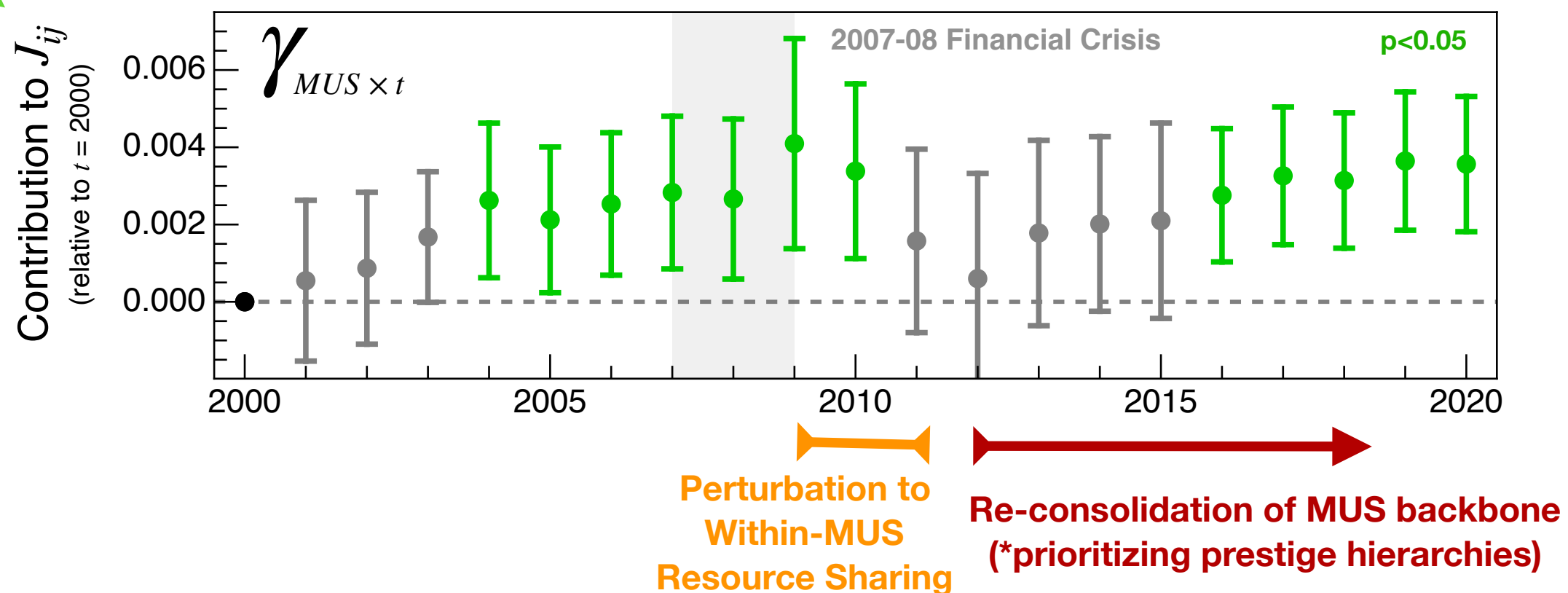
2024 operation budget: \$28 billion
 2022 research expend.: \$3.8+ billion (13%)
www.utsystem.edu

Modeling the Structure → Function relationship: How does a particular regional innovation system configuration promote particular outcomes (structure, resilience, innovation capacity, competitiveness, etc.)

Regression model for the pairwise strength of institutional research co-production, $J_{ij,t}$

$$\bar{J}_{ij} \pm Std. Dev. = 0.005 \pm 0.007$$

Excess research co-production (J_{ij}) attributable to the **UC** & **UT** multi-campus university systems (**MUS**)



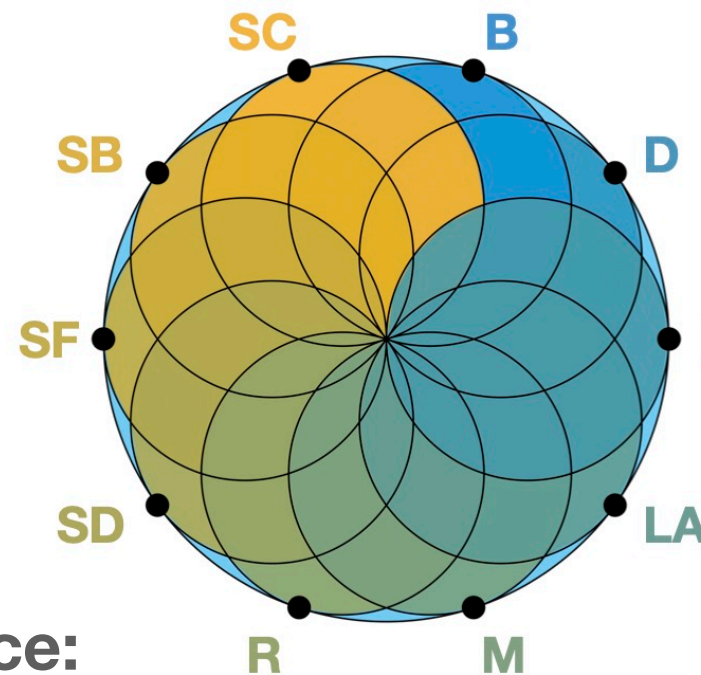
⇒ **MUS represent the RIS backbone,
source of resiliency to periodic socio-economic shocks**

Summary/Outlook

What? Constructed a framework for understanding the institutional factors that promote institutional integration and synergy at the regional scale

Why? Developed insight for managing the redundancy/specialization tradeoffs in multi-campus university systems (MUS):

UC System



Policy/Admin. Guidance:

- What is the optimal # of Departments of **Physics** (**Management of Complex Systems**) across the 10 UCs?
- How to distribute/invest in multi-campus research projects / infrastructure?
- How can system strategically navigate periodic socio-economic resource shocks (2007-8 financial crisis, COVID, present-day,...)
- **System/campus brand management: consolidation versus differentiation?**



a The New York Times

A Magnet for Latino College Students **UCM entity match**

In this week's Race/Related newsletter: A look at the University of California, Merced campus, and a visit to Charlottesville almost a year after the white nationalist rally.

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July 21, 2018

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The campus at the University of California, Merced, where about 53 percent of the undergraduates are Latino, closely mirroring the state's demographics. Max Whitaker for The New York Times

This is the web version of our Race/Related newsletter. Please [sign up here](#) to have it delivered weekly to your inbox.

By Jennifer Medina

UCLA **UCSC**

As a student at the University of California, Los Angeles decades ago, Alejandro Degadillo accepted that he would only occasionally see fellow students who looked like him. When he did, there was an

University digital media co-occurrence networks reveal structure and dynamics of brand visibility in the attention economy (HSS Comms. 2025)