



人大商学院
RENMIN BUSINESS SCHOOL

Innovations and (Shocks to) Industry-Academia Collaboration

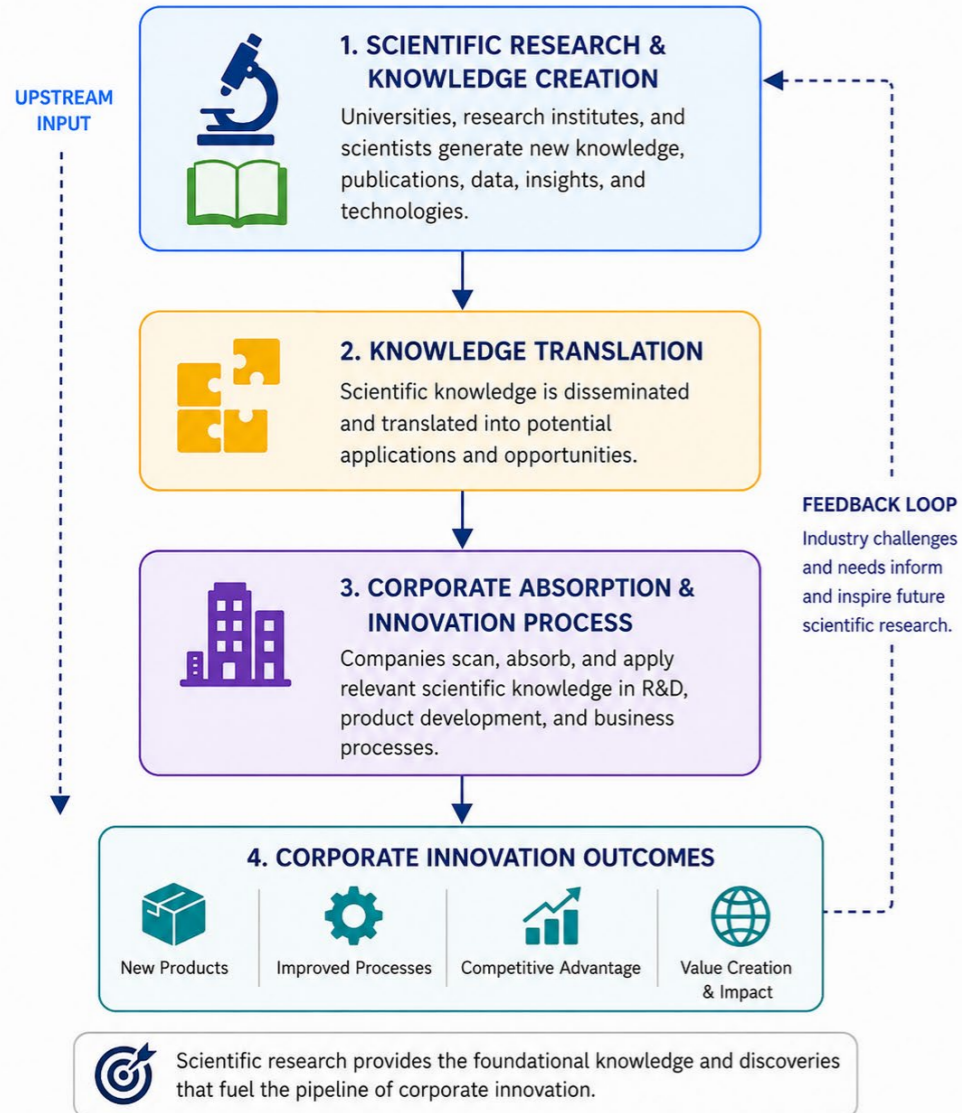
Anqi Jiao (Capital University of Economics and Business)

Evgeny Lyandres (Tel Aviv University)

Honglin Ren (Renmin University of China)

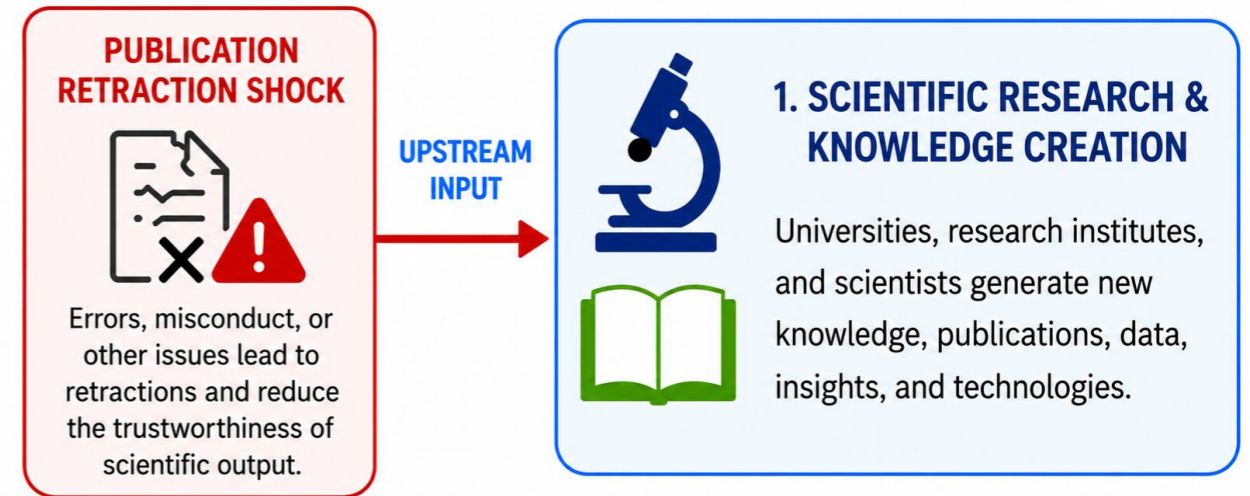
18 May 2026 – Asian Bureau of Finance and Economic Research (ABFER)

Scientific research is an important upstream input to corporate innovation.



- University research increases corporate patenting, public R&D funding stimulates private-sector patenting, star scientists shape biotechnology firm formation (Jaffe, 1989; Zucker, Darby, and Brewer, 1998; Azoulay et al., 2019).
- Industry–university collaboration helps firms access frontier science, expand technological opportunities, and support both new and ongoing R&D projects (Cohen, Nelson, and Walsh, 2002; Fabrizio, 2009; Hsu et al., 2025).

- What happens when the scientific knowledge being transmitted becomes less reliable?
- Scientific retractions often reflect misconduct, data fabrication, or major methodological flaws, which might reduce the trustworthiness of scientific output.



NEWS | 12 December 2023

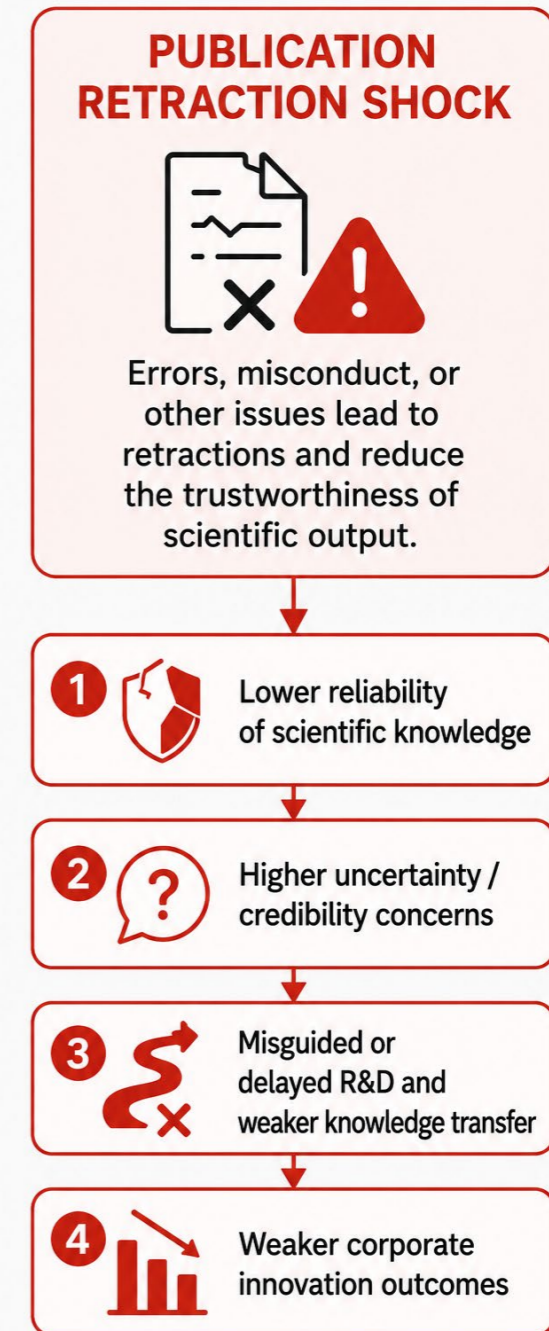
More than 10,000 research papers were retracted in 2023 – a new record

The number of articles being retracted rose sharply this year. Integrity experts say that this is only the tip of the iceberg.

- Economics evidence shows that retractions operate as **credibility shocks**.
 - Citations to the retracted paper decline sharply, and the effects spill over to related research fields and nearby intellectual areas (Furman, Jensen, and Murray, 2012; Azoulay et al., 2015).
 - Damage authors' prior work and spill over to uninvolved collaborators (Azoulay, Bonatti, and Krieger, 2017; Hussinger and Pellens, 2019).
 - Affect downstream patent knowledge flows (Freilich and Kim, 2026).
- Retractions reveal **broader uncertainty about the validity of knowledge production process**. If firms build R&D projects on that knowledge, then the consequences may extend beyond academia and affect corporate innovation.

- Do shocks to academic credibility, specifically the retraction of scientific publications, affect corporate innovation outcomes and the structure of industry–university collaboration networks?

- Retractions **undermine the reliability** of the scientific knowledge underlying ongoing R&D projects => affect the scale and effectiveness of corporate innovation.
- Retractions may also **reduce firms' expected benefits** from future university collaboration => change future collaboration decisions



- We identify firm-university collaborations through co-filed patents
- Firms experience **negative market reactions** around retraction events, with losses of about 30 bps over a seven-day window for severe events.
- Retractions are followed by **weaker innovation performance**: lower patent output, fewer citations, and reduced R&D efficiency, with little evidence of changes in R&D input.
- Firms adjust their external knowledge sourcing by **reducing both existing and new** firm-university collaborations, especially in the first two years after retraction events

- Contribute to the literature on industry-university collaboration by uncovering a previously **unexplored source of fragility** in collaborative innovation.
- Contribute to the literature on the determinants of corporate innovation by identifying **upstream scientific reliability** as a novel external driver of firm innovation outcomes.
- Contribute to the growing literature on scientific misconduct and research retractions by showing that their consequences extend beyond academia and **propagate into real corporate innovation activity**.

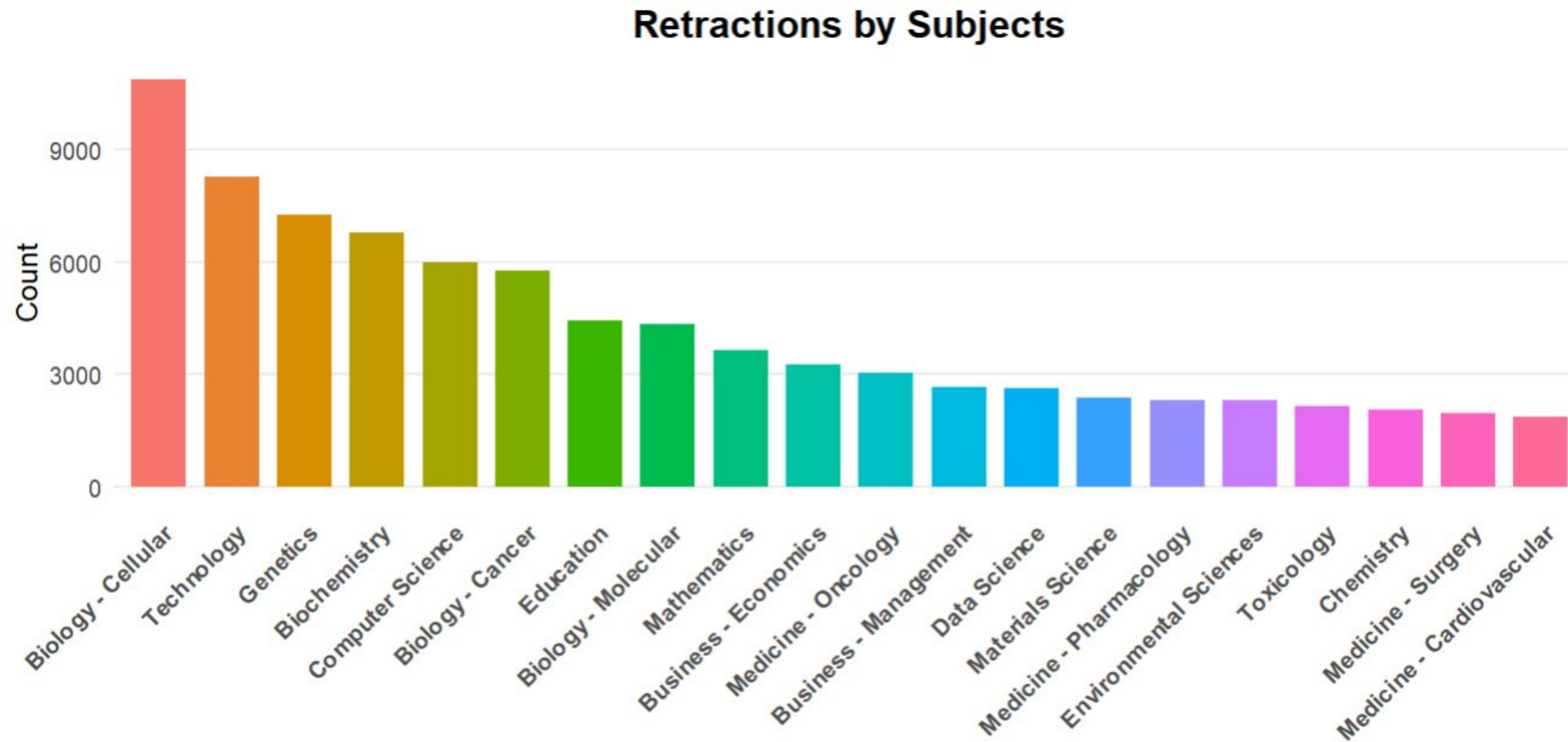
- Sample: all non-financial A-share firms listed in Shanghai and Shenzhen during 2009-2022, excl. ST and PT firms
- China Stock Market and Accounting Research (CSMAR): firm financials, R&D spending, stock returns, Fama-French three factors
- Final panel: 33,630 firm-year panel representing 4,392 unique firms with positive R&D spending (~80%).
 - Results are similar using the full sample of firm-year observations, both with and without conditioning on positive R&D spending

- Chinese patent data are obtained from the Derwent World Patents Index (DWPI), which covers patent publications from the China National Intellectual Property Administration (CNIPA).
- Include detailed bibliographic and technical information for each patent, including application numbers, filing dates, International Patent Classification (IPC) codes, [applicant names](#), inventor names, and [forward citation counts](#).
- Three categories: invention patents, utility model patents, and design patents. Invention patents are regarded as more indicative of innovative capabilities (Zhou, Gao, and Zhao, 2017; Fang, He, and Li, 2020)

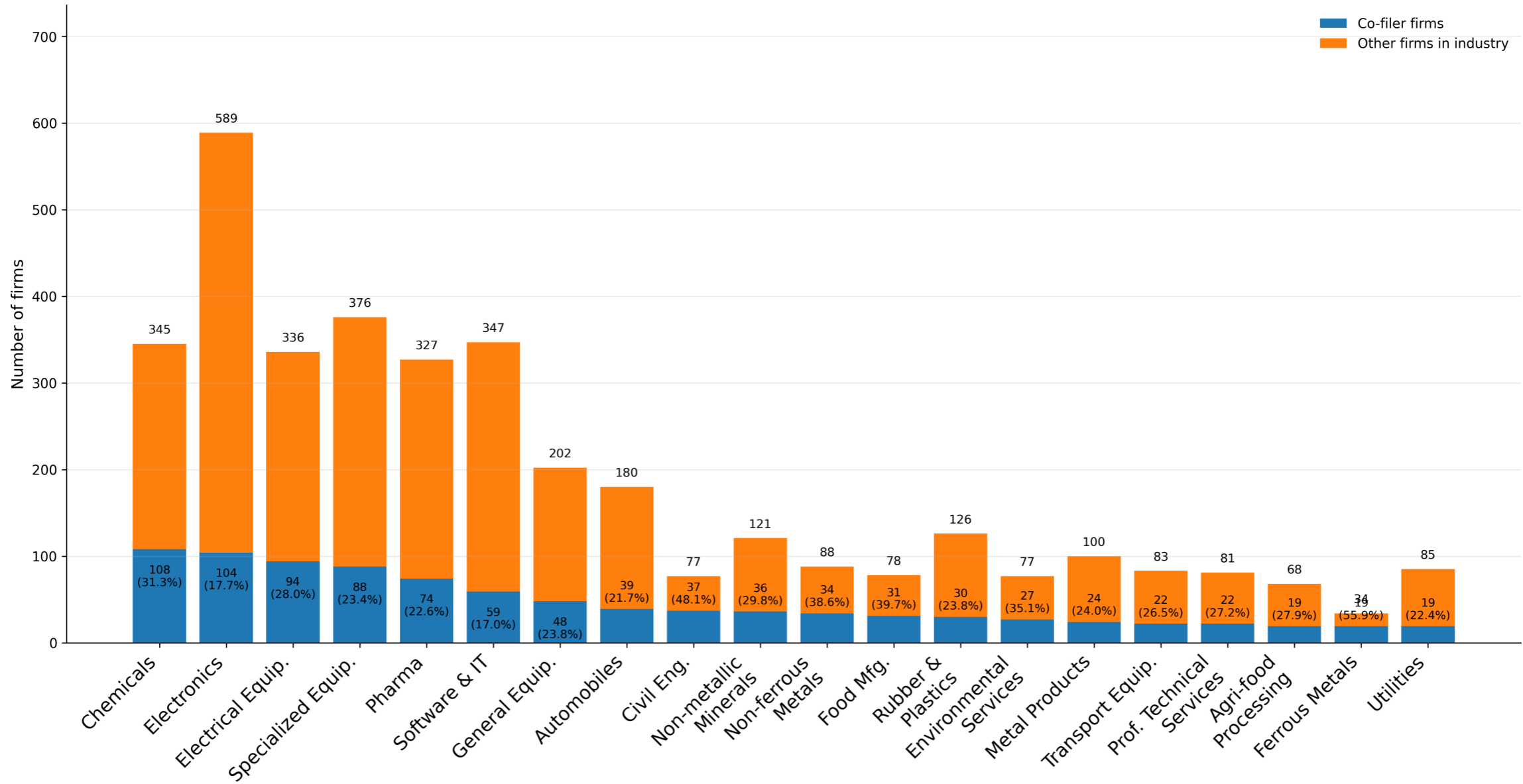
- Firm–university ties through **jointly filed patents**. Co-filed patents capture formal, innovation-oriented collaborations with clear partner identity and timing.
- Identify firm-university co-filed patents
 - Step 1. Identify patents filed by publicly listed firms through CNRDS links
 - Step 2. Compile a comprehensive list of Chinese universities and their corresponding English names: **934** universities
 - Step 3. Identify university co-applicants using the applicant names information: **301** universities have jointly filed patents with public firms
- Firm–university collaboration links are defined using a **five-year window** around joint patent filings.

- **RetractionWatch.com**: a comprehensive and widely used source that tracks retracted publications across scientific disciplines (Cox, Craig, and Tourish, 2018; Freilich and Kim, 2023)
 - provides detailed metadata including the publication title, journal, authors, DOI, publication and retraction dates, documented reasons for retraction, subject classification, and the **institutional affiliations** of the authors
 - retraction reasons in the database include concerns/issues related to data, results, peer review, human subject welfare, and referencing, among others.

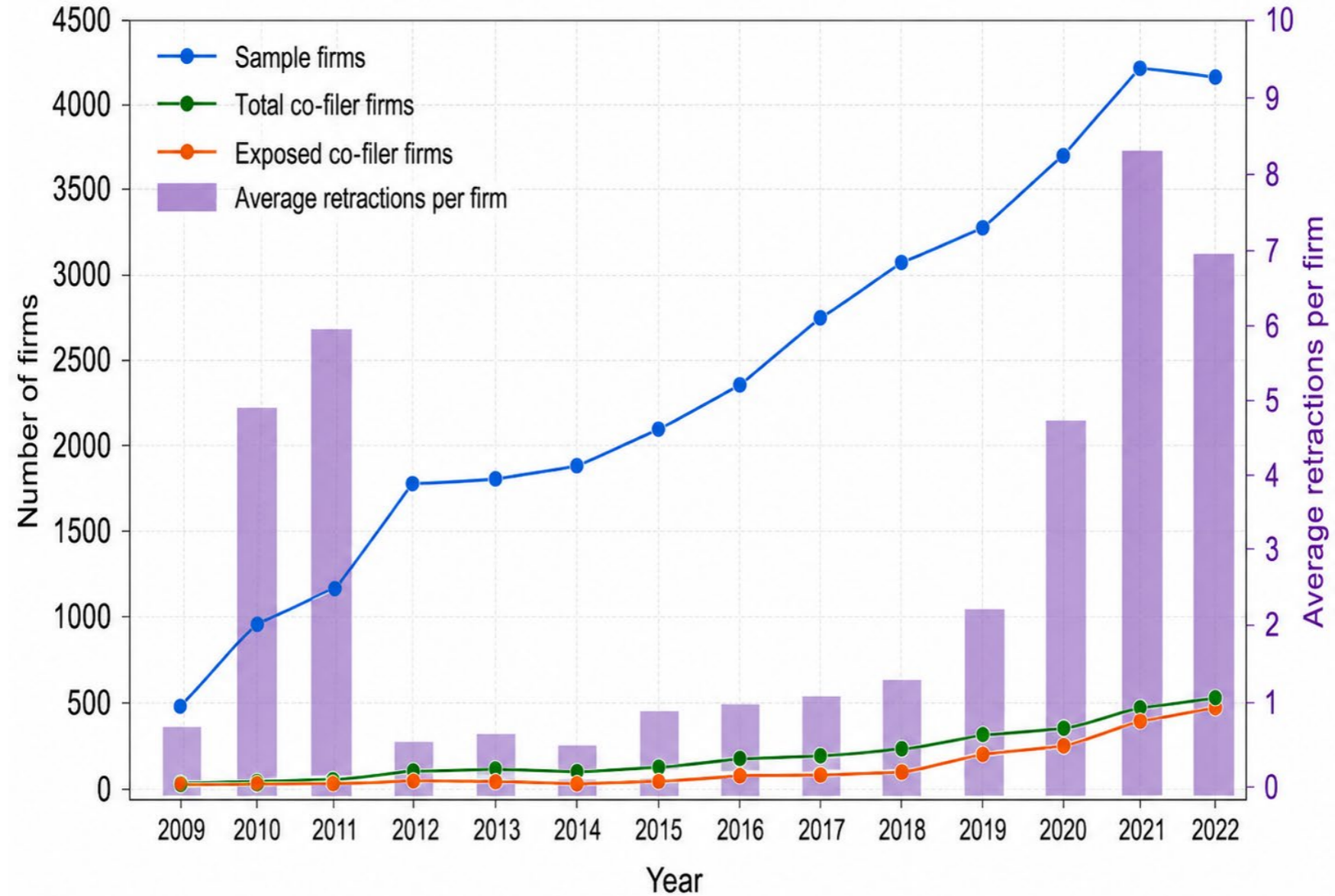
- Disproportionately represented in fields closely linked to applied innovation, patents, such as biology, medicine, and life sciences.



Industries with the Most Co-filer Firms:
Co-filer Firms as a Share of Total Industry Firms (Top 20)



Sample Firms, Total and Exposed Co-filer Firms, and Average Retractions per Firm



$$CAR_{i,d} = \alpha + \beta Retraction_{i,d} + \gamma \mathbf{X}_{i,t} + F_i + F_d + F_{ind \times year} + F_{province \times year} + \epsilon_{i,d},$$

- CARs: Cumulative abnormal returns (Market Model and FF 3-factor model) over [-1,+1], [-3,+3], [-5,+5] windows; estimation window of [-120, -20] trading days
- Retraction (dummy): on a given day, any university linked to the firm has a paper retraction
- Firm-level controls: Collaborated Universities (log), Total Patent (log), Firm Size, Leverage, ROA, Market to Book, Cash Holdings, and R&D Intensity.
- Fixed effects: Firm and day FEs, industry-by-year FEs, province-by-year FEs.
- Standard errors are clustered at the firm level.

	MM [-1,+1]	MM [-3,+3]	MM [-5,+5]	FF3 [-1,+1]	FF3 [-3,+3]	FF3 [-5,+5]
Panel A: Firm + Date FE						
<i>Retraction (dummy)</i>	-0.036**	-0.056*	-0.039	-0.016	-0.055**	-0.059*
Panel B: + Ind×Yr, Prov×Yr FE						
<i>Retraction (dummy)</i>	-0.043**	-0.066**	-0.055	-0.021	-0.063**	-0.074**

- Consistent negative estimates suggest **adverse capital market reactions** to retraction events (~3-6bp)
- Consistent with the interpretation that these events convey negative information about firms that rely on the scientific output of affected universities

We expect that stock price reactions would vary across firms depending on

- the **intensity** of their exposure to retractions: *more than three* simultaneous retractions on a given day (**stronger**)
- the **severity** of the retraction event: retractions citing *more than three stated issues or concerns* (**stronger**)
- the **firm's reliance** on university as a knowledge partner: firms with *more than one collaborated university* (**less clear**)
 - Dependence on academic research versus potential diversification benefits

	MM [-1,+1]	MM [-3,+3]	MM [-5,+5]	FF3 [-1,+1]	FF3 [-3,+3]	FF3 [-5,+5]
Panel A. Multiple Retraction						
<i>Multiple Retraction (dummy)</i>	-0.1546**	-0.2976***	-0.2570*	-0.0954	-0.2650***	-0.3330**
<i>Retraction (dummy)</i>	-0.0288	-0.0421	-0.0271	-0.0115	-0.0426	-0.0441
Panel B. Multiple Concern Retraction						
<i>Multiple Concern Retraction (dummy)</i>	-0.1073***	-0.0865	-0.0899	-0.0783**	-0.1222**	-0.1722**
<i>Retraction (dummy)</i>	0.0230	-0.0082	0.0105	0.0271	0.0123	0.0351

Firms experience significantly more negative stock market reactions when exposed to multiple retractions or more severe retractions.

	MM [-1,+1]	MM [-3,+3]	MM [-5,+5]	FF3 [-1,+1]	FF3 [-3,+3]	FF3 [-5,+5]
Panel C. Multiple University Collaboration						
<i>Retraction (dummy) x Multi Univ. Collaboration (dummy)</i>	-0.0578	-0.1295**	-0.0014*	-0.0606	-0.1275**	-0.1275
<i>Multiple Univ. Collaboration (dummy)</i>	0.0162	0.0418	0.0005	0.0193	0.0360	0.0392
<i>Retraction (dummy)</i>	0.0048	0.0354	0.0006	0.0268	0.0350	0.0304

Retractions have a larger adverse market impact on firms more heavily engaged with universities, suggesting that dependence on academic research effect dominates any potential diversification benefits from broader collaboration networks.

Do upstream knowledge disruptions reshape the scale and effectiveness of corporate innovation?

- **Innovation outputs and inputs:** may decline if firms delay, scale back, or discontinue projects linked to compromised scientific inputs.
- **Innovation quality:** patents may become less novel or have weaker technological impact.
- **Innovation efficiency:** may decline if R&D spending becomes less productive.

$$Y_{i,t+k} = \alpha + \beta \text{University Paper Retraction}_{i,t} + \gamma \mathbf{X}_{i,t} + F_i + F_t + \epsilon_{i,t+k}.$$

- $Y_{i,t+k}$: denotes firm i 's innovation outcomes – measured in quantity, quality, input, or efficiency – in years $t+1$, $t+2$, and $t+3$.
- $\text{University Paper Retraction}_{i,t}$: logarithm of the total number of retractions occurring at universities linked to firm i in year t .
- Firm-level controls: Collaborated Universities (log), Firm Size, Leverage, ROA, Market to Book, Cash Holdings, and R&D Intensity.
- Fixed effects: Firm and year FEs.
- Standard errors are clustered at the firm level.

Dependent Variable	t+1	t+2	t+3	Econ. Sig. Range
Total Patent (log)	-0.133***	-0.154***	-0.128***	↓ 7.6–9.2%
University Total Patent (log)	-0.063***	-0.052***	-0.040***	↓ 34.6–53.9%
Innovative Patent (log)	-0.074***	-0.093***	-0.076***	↓ 6.7–8.5%
Univ. Innovative Patent (log)	-0.021***	-0.011***	-0.005	↓ 21.8–83.9%

- A systematic drop in patent quantity over subsequent three years
- Effects are stronger for patents co-filed with universities

Dependent Variable	t+1	t+2	t+3	Econ. Sig. Range
Avg. Total Citation (log)	-0.062***	-0.036***	-0.008	↓ 2–13%
Avg. Univ. Total Citation (log)	-0.074***	-0.039***	-0.012	↓ 14–83%
Avg. Innovative Citation (log)	-0.031***	-0.014**	0.006	↓ 2–12%
Avg. Univ. Innov. Citation (log)	-0.019***	-0.006	0.004	↓ Up to 137%

- Quality effects concentrated in first two years. University-collaborative patent citations suffer the steepest declines.
- Retractions weaken not only the volume but the technological significance of innovations.

Table 7: patent quantity/R&D spending

Dependent Variable	t+1	t+2	t+3	Econ. Sig. Range
Total Patent / Total R&D	-0.018**	-0.019**	-0.002	~6.5%
Univ. Patent / Total R&D	-0.0019***	-0.0014***	-0.0010**	31–59%

Table 8: citation/R&D spending

Dependent Variable	t+1	t+2	t+3	Econ. Sig. Range
Total Citation / Total R&D	-0.069***	-0.019	0.044*	~13%
Univ. Citation / Total R&D	-0.008***	-0.003*	-0.001	30–83%

The productivity of R&D investments deteriorates as upstream knowledge becomes less reliable.

Dependent variable: R&D Intensity – a firm’s annual R&D expenditures scaled by total assets

	t+1	t+2	t+3	t+1	t+2	t+3
<i>Univ. Paper Retraction (log)</i>	-0.0004	-0.0004	-0.0001	-0.0001	-0.0004	-0.0001
<i>Retraction × Neg. Mkt. Rxn</i>				-0.0005**	0.0001	-0.0000

Firms do not appear to systematically adjust R&D spending following retractions, except for a modest and short-lived decline when retractions are accompanied by negative stock market reactions.

Implication: Retractions primarily operate through a productivity channel, eroding the effectiveness of R&D rather than changing firms’ R&D investment levels.

- **Credibility shock:** Retractions raise concerns about the reliability of academic research.
 - *Existing partnerships:* do firms change future joint patenting with affected university partners?
 - *New partnerships:* Do firms seek alternative academic collaborators, or do they become more cautious in forming new university partnerships?

- Use firm-university-year panel of all pairs that have ever co-filed a patent
- Dependent var: whether the pair collaborates in future years

Dep. var: Collaboration (dummy)	t+1	t+2	t+3
	Firm + Univ. + Year FE		
Paired Univ. Retraction (log)	-0.0073*	-0.0103*	-0.0175**
Econ. significance	-6.1%	-4.8%	-5.7%
	Firm-University + Year FE		
Paired Univ. Retraction (log)	-0.0076*	-0.0107*	-0.0180**
Econ. significance	-6.4%	-5.0%	-5.8%

- A one s.d. increase in retraction exposure reduces the prob. of future collaboration by 5–6%.

- Firm-year sample
- Dependent variable: log number of new university partners established in the subsequent k years
- Independent variable: retractions at current partner universities

Dep. Var: log (new uni. partners)	t+1	t+2	t+3
<i>University Paper Retraction (log)</i>	-0.034***	-0.021***	-0.010
Economic significance	-84.8%	-25.8%	-8.3%

- Retractions at current partner universities lower the likelihood that firms initiate new collaborations in the short run.

- Scientific retractions have adverse implications for firms linked to affected universities.
 - Negative capital market reactions
 - Weaker patent output, lower technological significance of new inventions, and reduced efficiency in converting R&D into innovation
 - Firms respond by pulling back from both existing and new academic collaborations.
- Scientific integrity is a crucial input to innovation. **Strengthening the reliability and transparency** of scientific research may yield benefits that extend into the corporate sector, increasing the **stability and productivity** of the innovation economy.