Board Characteristics and AI Adoption

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MOTIVATION

- Artificial intelligence is spreading through the corporate sector rapidly, but very unevenly.
- Demand for AI-related labour in the US grew roughly tenfold over the 2010s (Alekseeva et al., 2021).
- AI has the breadth of a general-purpose technology (Brynjolfsson et al., 2021; Goldfarb et al., 2023).
- Adoption matters for firm growth, product innovation and productivity (Babina et al., 2024; Acemoglu et al., 2022).
- Adoption is highly concentrated: within a narrow industry and a single year, some firms staff sizable AI workforces while comparable firms employ almost none.
- Size, financial slack and industry explain only part of the variation.

⇒this directs attention to the **governance** margin of the adoption decision.

RESEARCH QUESTION

- We study a determinant that sits at the top of the firm: the **board of directors**.
- The board approves large and uncertain investments, hires and monitors the CEO, and channels outside information into the firm (Adams et al., 2010).
- Adopting a general-purpose, skill-intensive and uncertain technology is exactly the kind of discretionary choice for which board vision, information and risk tolerance should matter.
- **Question: How do the characteristics of the board relate to a firm's AI adoption?**

RELATED LITERATURE

- **Economics of AI and diffusion.** AI is economically consequential and unevenly adopted (Brynjolfsson et al., 2021; Goldfarb et al., 2023; Acemoglu et al., 2022; Alekseeva et al., 2021; Babina et al., 2024).
- **Boards and corporate policy.** Board composition shapes risk-taking, financial policy, innovation and the quality of advice (Coles et al., 2008; Guner et al., 2008; Bernile et al., 2018; Fich and Shivdasani, 2006; Balsmeier et al., 2017).
- **Director networks.** Board connectedness relates to performance, policies and acquisitions (Larcker et al., 2013; Fracassi and Tate, 2012; Cai and Sevilir, 2012).
- **Boards and AI.** AI as a governance *tool* or the board's *oversight* of AI (Hilb, 2020; Ferreira and Li, 2025).
- **AI adoption.** Factors related to AI adoption (Cette et al., 2026; Coyle et al., 2026; Chatjuthamard et al., 2026).

⇒We ask how a board's human and network capital predicts *adoption*.

DATA

- Firm-year panel of US public firms, 2010-2018, from three sources.
- **BoardEx:** director education, qualifications, nationality, gender, board memberships, tenure, and the full history of employment spells (employer, sector, role title, dates).
- **Compustat:** assets, sales, capital expenditure, R&D, equity, shares and price, SIC and NAICS codes.
- **AI adoption** (Babina et al., 2024): the share of a firm's job postings in a year that require AI and machine-learning skills, in percentage points.
  - Postings capture the intent to build AI capacity across the whole cross-section.
  - Limitation: intended hiring rather than realised deployment.
- Final sample: 19,363 firm-years on 3,149 firms; 18,242 carry a board index.

MEASURING BOARD TECHNICALITY: FOUR TRAITS

Built from the career histories of the directors themselves.

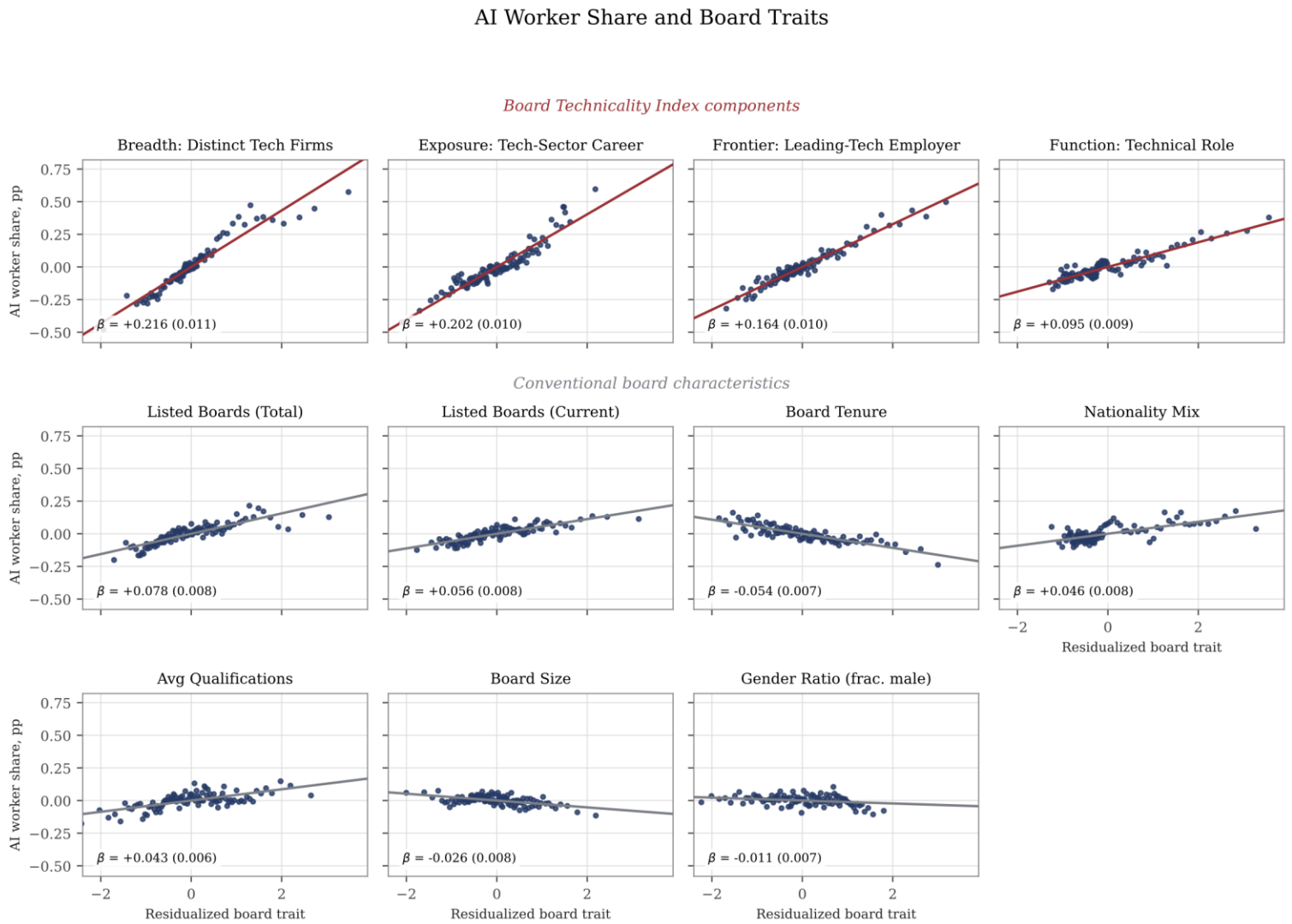
- **Exposure:** share of directors who have worked in the technology sector at any point.
- **Breadth:** average number of distinct technology firms the directors have passed through.
  - separates a career inside one technology firm from one that has seen several.
- **Function:** share of directors who have held a technical role rather than sitting above one (CTO, CIO, engineer, scientist).
- **Frontier:** share who worked at a leading technology firm, defined as the top 10 percent of technology firms by sales in the year of the spell.

Conventional board characteristics (outside directorships, qualifications, nationality mix, tenure, board size, gender ratio) enter as controls.

DESCRIPTIVE STATISTICS

	Mean	SD	Min	Max	N
Outcome					
AI worker share (pp)	0.49	0.49	0.05	2.80	19,363
Board technicality					
AI Board Index (standardized)	0.00	1.00	−1.04	4.20	18,242
Exposure: tech-sector experience	0.40	0.30	0.00	1.00	18,242
Breadth: distinct tech firms	1.27	1.71	0.00	8.41	18,242
Function: technical roles	0.05	0.09	0.00	0.40	18,242
Frontier: leading tech firms	0.13	0.18	0.00	0.75	18,242
Board characteristics					
Listed boards, total	3.05	1.33	1.00	7.00	19,354
Listed boards, current	1.70	0.51	1.00	3.20	19,328
Avg qualifications	2.14	0.49	0.80	3.40	19,363
Nationality mix	0.10	0.18	0.00	0.70	18,598
Board tenure (yrs)	8.07	4.43	0.30	21.00	19,363
Board size	8.84	2.27	4.00	15.00	19,363
Gender ratio (frac. male)	0.87	0.11	0.20	1.00	19,363
Firm controls					
Log assets	7.34	1.96	2.99	12.17	19,356
Log sales	6.72	2.03	0.48	11.39	19,353
CapEx / assets	0.04	0.04	0.00	0.24	19,302

AI WORKER SHARE AND BOARD CHARACTERISTICS



- The four technicality traits trace much steeper slopes than the conventional characteristics; breadth is the steepest.
- Directorships, nationality mix and qualifications are positive but far shallower; tenure and board size are negative; gender ratio is flat.

CONSTRUCTING THE AI BOARD INDEX

Three steps, so that the board profile is summarised on one interpretable scale.

1. Each trait k is winsorized at the 1st and 99th percentiles and standardized,

$$z_{k,it} = \frac{x_{k,it} - \bar{x}_k}{\mathrm{sd}(x_k)}$$

2. The four standardized traits are averaged,

$$\widetilde{B}_{it} = \frac{1}{4}\sum_{k\in\mathcal{K}} z_{k,it}, \qquad \mathcal{K} = \{\text{Exposure, Breadth, Function, Frontier}\}$$

3. The average is restandardized:

$$B_{it} = (\widetilde{B}_{it} - \overline{\widetilde{B}})/\mathrm{sd}(\widetilde{B})$$

A high-index board has seen the technology at close range and can judge what building an AI capability involves.

EMPIRICAL STRATEGY

$$\text{AI share}_{it} = \beta B_{it} + \gamma' X_{it} + \delta_{j(i)t} + \alpha_i + \varepsilon_{it}$$

- $\boldsymbol{AI\ share_{it}}$: ***AI adoption*** measure, share of firm *i*'s postings in year *t* calling for AI skills, in percentage points.
- $\boldsymbol{B_{it}}$: standardized AI Board Index.
- $\boldsymbol{X_{it}}$: firm controls (firm fundamentals and the conventional board characteristics).
- $\boldsymbol{\delta_{j(i)t}}$: industry-by-year fixed effects (2-digit NAICS × year).
- $\boldsymbol{\alpha_i}$: firm fixed effects.
- Outcome and controls winsorized at 1/99 percent; standard errors clustered by firm.

$\Rightarrow \beta$ is the change in the AI worker share per one SD of board technicality.

MAIN RESULTS

Dep. var.: AI Adoption	All sectors				Without tech sector			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
AI Board Index	0.222***	0.035***	0.035***	0.035***	0.198***	0.033**	0.033**	0.036**
	(0.010)	(0.013)	(0.013)	(0.013)	(0.017)	(0.014)	(0.014)	(0.014)
Ind × Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	No	Yes	Yes	Yes	No	Yes	Yes	Yes
Firm controls	No	No	Yes	Yes	No	No	No	Yes
Board controls	No	No	No	Yes	No	No	No	Yes
Observations	18,239	17,991	17,991	17,991	13,362	13,204	13,156	12,602

*Standard errors clustered by firm in parentheses. * p<0.10, ** p<0.05, *** p<0.01.*

INTERPRETING THE MAIN RESULTS

- **Between firms** (column 1): a board one SD more technical goes with an AI worker share higher by 0.222 pp, close to half of what the typical firm employs in AI.
  - but firms that recruit technical directors are not otherwise identical to firms that do not.
- **Within firm** (column 2): when a firm's own board becomes one SD more technical, its AI worker share rises by 0.035 pp, roughly 7 percent of the mean, significant at 1 percent.
- The drop between the two suggests most of the cross-sectional gap is persistent firm heterogeneity.
- Robust to firm and conventional board controls (column 3 and 4 respectively).
- **Excluding the technology sector** (columns 5–8): the within-firm coefficient is similar, 0.033–0.036 pp, and remains significant at the 5 percent level throughout, so the result is not driven by technology firms alone.

WHICH BOARD TRAITS MATTER MOST?

	AI Adoption							
	All	No tech	All	No tech	All	No tech	All	No tech
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Experience in Tech Firms ("Exposure")	0.006	0.007						
	(0.009)	(0.009)						
Distinct Tech Firms ("Breadth")			0.052***	0.046**				
			(0.016)	(0.023)				
Technical Role ("Function")					0.008	0.006		
					(0.007)	(0.007)		
Star Tech Firm ("Frontier")							0.022**	0.034***
							(0.011)	(0.013)
Observations	17,936	13,156	17,936	13,156	17,936	13,156	17,936	13,156

*Odd columns: all sectors; even columns: excluding tech. Firm and industry-by-year fixed effects, and firm/board controls, included throughout. * p<0.10, ** p<0.05, *** p<0.01.*

- **Breadth** and **frontier** are the main predictors of AI adoption.
- Adoption rises with breadth across tech firms and closeness to the frontier, not simply from tech-sector tenure.
- Robust to excluding the technology sector.

A BOARD-MEMBER DEATH SHOCK

- Everything so far compares boards that firms *chose*: expertise is mixed with intent.
- The unexpected death of a sitting director is a change the firm did not make in response to its own plans (Nguyen and Nielsen, 2010).
- **Design:** compare directors *more* technical than the board average (the firm loses real expertise) against directors *less* technical than the average, the natural placebo.
  - Within each group, compare deaths *in office* (more unexpected) against deaths within a year of *leaving* the board (more foreseeable).
- Both regressors are cumulated, standardized counts of each kind of death; so each rises as more of that kind of death happens to the firm. Age cutoff at 70 (Nguyen and Nielsen, 2010).
- 329 deaths at 319 firms among more-technical directors; 75 deaths at 75 firms in the less-technical placebo group.

AI HIRING AFTER A DIRECTOR DIES

Dep. var.: AI Adoption	(1)	(2)	(3)	(4)
TD lost (in office)	−0.006**	−0.006**	−0.006**	−0.006**
	(0.002)	(0.002)	(0.002)	(0.002)
TD lost (left, died within a year)		0.003	0.003	0.003
		(0.002)	(0.002)	(0.002)
Less TD lost (in office)			0.005	0.005
			(0.006)	(0.006)
Less TD lost (left, died within a year)				−0.002
				(0.002)
Board controls	No	No	No	Yes
Observations	19,059	19,059	19,059	18,268

*Dep. var.: AI Adoption. TD = technical director (above the board's own average); regressors are cumulated, standardized death counts. Firm and industry-by-year FE and firm controls throughout. * p<0.10, ** p<0.05, *** p<0.01.*

- Losing a more-technical director unexpectedly (in office) cuts AI worker share by 0.006 pp per SD, robust across columns 1–4.
- Foreseeable departures and losses of less-technical directors show no such effect: the placebo is flat throughout.
- Comparable in size to the within-firm effect of a one-SD rise in the AI Board Index.

CONCLUSION

- We describe each board by how much of its collective working life has been spent inside the technology sector, across how many technology firms, in technical roles, and at frontier firms.
- Firms whose boards score higher on that index hire substantially more AI workers than their industry and year peers; within firm, breadth and frontier are the components that matter most.
- Losing a more-technical director unexpectedly slows AI hiring; foreseeable departures and losses of less-technical directors show no such effect.
- **CEOs:** in reduced-form analysis, board characteristics matter far more than CEO characteristics. The within-firm association of the AI Board Index with adoption is roughly eight times that of the CEO Technicality Index.
- **Heterogeneity:** we also show that the reduced-form effect is significantly larger in growth-oriented, R&D-intensive and more liquid firms, but does not vary systematically with firm size or age.
- **Next:** coding the *causes* of director deaths from obituaries and press reports to isolate genuinely unanticipated losses.

Thank you

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