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Original Paper

Technological Distance and Post-Merger Performance: Evidence on Labor Market Frictions from China

Haoxin Xu[1], & Gan Lin[2]

[1] University of Shanghai for Science and Technolog, Shanghai, China

[2] University of Shanghai for Science and Technolog, Shanghai, China

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Abstract

In the context of technology-driven mergers and acquisitions, how technological distance between acquirers and targets shapes post-merger operating performance has become an important issue in corporate finance and industrial organization research. This paper studies how technological distance between acquirers and targets affects acquirers' post-merger operating performance, and whether employee bargaining conditions shape this relationship. Using a Chinese listed-firm panel from 2017 to 2024, we employ a triple difference estimation to show that: First, acquirers experience lower return on assets (ROA) after deal completion. Second, the post-merger ROA decline is more pronounced among high-technology-gap acquirers. Third, the triple interaction of the post-merger indicator, technological distance, and bargaining conditions reaches statistical significance only when deals completed in 2020 are excluded. Continuous full-sample estimates remain sensitive to specification. These findings provide supportive evidence that technological distance and labor-market frictions jointly shape post-merger operating performance.

Keywords

mergers and acquisitions, technological distance, employee bargaining conditions, post-merger performance

1. Introduction

Mergers and acquisitions reallocate productive resources, spread technology, and reshape industry structure. Classic studies of the market for corporate control show that takeovers discipline managers and move assets to more productive owners. In knowledge-intensive economies, technological capabilities increasingly determine firm boundaries and competitive advantage. Technological differences between acquirers and targets therefore affect both post-merger integration efficiency and

the negotiation process that divides merger surplus. Technological distance can alter the relative bargaining positions of the two parties and, ultimately, the long-run performance of the acquirer.

A substantial body of research examines both the determinants and consequences of mergers and acquisitions. One strand focuses on efficiency improvements, synergy realization, corporate governance, and announcement-period market reactions [1,2,3]. Another investigates the roles of information asymmetry, market liquidity, and the choice of payment method [4,5]. Recent work emphasizes technological relatedness and knowledge transfer [6]. These studies show that innovation capabilities and productivity differences shape integration success. Yet most of them focus on post-merger outcomes and pay less attention to the negotiation stage where surplus is allocated.

M&A negotiations can be read as surplus-sharing over expected synergies [1]. Pre-deal technology gaps pull bargaining power in opposite directions. When the gap is wide, the acquirer may rely heavily on the target's knowledge and specialized human capital, which strengthens the target's hand—consistent with acquisitions aimed at external technology that is costly to replicate in-house [6]. When the acquirer is technologically stronger, it may enjoy better outside options and a greater capacity to replace target assets, which weakens the target. Work on technology spillovers further indicates that both the value and the difficulty of an acquisition depend on technological proximity [7]. These competing forces generate systematic variation in negotiation outcomes that can carry into post-merger performance.

Direct evidence on how technological distance maps into bargaining power—and from there into acquirers' long-run operating performance—remains limited. M&A studies show that governance, information asymmetry, liquidity, and payment structure shape deal outcomes [2]; technology-oriented research stresses innovation complementarities, relatedness, and post-merger knowledge integration [6]. The two literatures are seldom joined: few papers link ex-ante technological differences to micro-level bargaining proxies, and even fewer trace negotiation frictions into multi-year ROA. Much empirical work stops at short-run market reactions or post-merger restructuring, without treating surplus allocation during the deal as an explicit transmission channel. The internal pathway from technological heterogeneity to M&A performance is therefore still only partly understood.

We examine whether pre-deal technological distance is associated with acquirers' post-merger operating performance and whether that association varies with employee bargaining conditions. Technological distance is defined as the absolute difference between acquirer total factor productivity (TFP) and target TFP, with TFP estimated using the Levinsohn–Petrin (LP) method and the Ackerberg–Caves–Frazer (ACF) correction. In the empirical implementation, bargaining conditions are proxied by local labor-market concentration and employee outside options.

Using a matched listed-firm panel linked to M&A timing, we find that acquirers tend to record lower ROA after deal completion; the pattern is clearer in the HighTech subsample. When TechGap enters as a continuous interaction, coefficient signs and significance change across specifications, so the technology-gap effect should not be interpreted as uniformly positive or uniformly negative. Evidence

for employee bargaining power as a full mediation channel is weak. The preferred reading is that Bargain moderates the technology–performance relationship, and the triple interaction becomes significant mainly in the pandemic-adjusted sample that excludes 2020 deals.

This reading fits the economics of technology-oriented integration. Deal value is not fully realized at signing: the acquirer must combine workers, routines, production assets, and knowledge systems that may have evolved under different organizational incentives. When acquired capabilities lie close to the acquirer's existing knowledge base, integration can proceed smoothly and assets may be redeployed quickly. When the technological gap is large, the acquirer may need to retain key employees, preserve local routines, or postpone restructuring to avoid disrupting production. These margins make labor-market bargaining conditions relevant for explaining why otherwise similar transactions can produce different long-run operating outcomes.

The study contributes in three ways. It links long-run operating performance to technology distance and labor-market frictions in the M&A literature; it shows that technology-related integration can generate heterogeneous performance consequences; and it highlights employee bargaining power as a potential moderating channel through which technological differences shape acquisition outcomes, rather than as conclusive evidence of full mediation.

The remainder of this paper is organized as follows. Section 2 reviews the related literature. Section 3 develops the theoretical framework and hypotheses. Section 4 presents the empirical model, data, and variable definitions. Section 5 reports the baseline results, identification diagnostics, robustness checks, heterogeneity analysis, and mechanism evidence. Section 6 concludes with managerial implications and limitations.

2. Literature Review

The contemporary literature on mergers and acquisitions identifies three central dimensions that shape acquisition outcomes: technological heterogeneity, bargaining dynamics, and post-merger performance [1,6]. Among these, technological differences between firms have received increasing attention in recent years, particularly in innovation-driven economies and knowledge-intensive industries. Research on corporate innovation shows that acquisitions often occur when firms seek complementary technological assets, patent portfolios, or knowledge positions that cannot be developed internally at the same speed [8,6,9]. A related strand emphasizes synergy creation and post-merger integration efficiency, showing that value creation depends on how acquired resources are redeployed after completion [10,11]. However, relatively less attention has been devoted to how technological distance affects the negotiation process through which merger gains are determined. The bargaining stage of M&A transactions remains underexplored, despite its critical role in shaping the allocation of surplus and subsequent firm-level outcomes [10,12].

Prior M&A research links deal outcomes to technological relatedness and innovation capacity. Acquisitions move technology across firm boundaries [6]; in high-tech sectors, relatedness predicts

innovative performance [8,13]. Knowledge-based views treat firms as repositories of combinative capabilities, with tacit, organization-specific knowledge costly to transfer [14]. Absorptive-capacity arguments imply that assimilating external knowledge requires prior related knowledge, so wider technology gaps raise integration frictions [15]. Boundaries and firm heterogeneity also shape R&D incentives and post-merger efficiency [16]. Spillover work maps a firm's position in technology space to learning benefits and product-market rivalry [17,7]. More recent integration studies treat acquirer–target distance as a friction for combining knowledge structures, production systems, and human capital [18,19,20]. Negotiation over how surplus is split nonetheless receives less systematic measurement than post-merger accounting outcomes.

Theoretically, acquirers and targets bargain over expected synergies [10]; relative negotiation strength partly determines who captures the gains [1,2,21]. Incomplete-contracting logic adds that when post-merger actions cannot be fully specified, ownership and residual control rights govern surplus division and integration choices [22]. Governance and market conditions matter too: entrenched managers may overpay, and liquidity or information asymmetry can shift terms and payment [3,4,5]. How pairwise technology gaps alter bargaining power—especially through labor-market dependence and post-merger implementation capacity—remains less explored.

We also draw on labor-market monopsony research, where employer concentration proxies workers' outside options and firms' wage-setting power [23]. Concentration correlates with worker outcomes [24]; employer HHI is standard in local labor markets [25]; higher concentration associates with weaker employee positions and lower wages [26]. We apply regional employer concentration to proxy bargaining conditions around technology-related integration. That market definition is coarser than occupation–location cells in the labor literature, but target employee locations are unavailable in our data.

3. Theoretical Framework and Hypotheses

Building on the literature reviewed above, this section develops the theoretical framework that links technological distance, employee bargaining conditions, and post-merger performance. The key intuition is that technology gaps simultaneously create potential gains from knowledge transfer and additional frictions in implementation [14,15]. Whether the acquirer can transform potential technological gains into realized operating performance depends partly on the bargaining environment surrounding employees and organizational routines that carry implementation-specific knowledge [11,8].

Technological distance may affect post-merger performance through multiple channels. When acquirers and targets exhibit large technological differences, integration requires the transfer of tacit knowledge, production routines, and human capital across organizational boundaries [14,6]. Such differences increase coordination costs, slow the realization of synergies, and make the acquirer more dependent on workers and units that control implementation-specific knowledge [15,13,11]. From the perspective of technology space and relatedness, larger distance raises the difficulty of combining assets and human capital after

completion [17,7,20,19]. Therefore, greater technological distance is expected to reduce acquirers' post-merger operating performance, especially when employee bargaining conditions make integration more costly [18,16].

Based on this discussion, we develop the first hypothesis:

H1: Greater technological distance is associated with lower acquirers' post-merger operating performance.

Once bargaining power is determined at the negotiation stage, it is likely to have persistent implications for post-merger performance. The allocation of merger surplus affects not only the initial terms of the transaction, but also subsequent managerial incentives, integration strategies, and resource allocation decisions [10,12]. Incomplete contracting theory further implies that residual control rights and bargaining positions shape post-deal adjustment when many integration actions cannot be fully specified ex ante [22].Stronger bargaining positions can yield more favorable transaction terms, with downstream effects on post-merger investment efficiency and operational restructuring [1,21]. Weaker positions, by contrast, may produce less favorable integration outcomes and lower long-run performance [3].

Bargaining frictions and governance arrangements likewise shape acquisition payoffs and firm value creation [2,3,10]. Research on firm boundaries and organizational efficiency indicates that conditions set at negotiation can echo through post-merger integration performance [16,22]. On the labor side, employer concentration and workers' outside options predict bargaining strength [23,25,24,26]. We treat employee bargaining conditions as a link between technological distance and long-run operating performance [27].

Accordingly, we propose the second hypothesis:

H2: Employee bargaining conditions are significantly associated with acquirers' post-merger long-run operating performance.

Combining the two hypotheses above, we further argue that bargaining conditions may moderate the relationship between technological distance and post-merger performance. Technological heterogeneity may change negotiation and integration frictions, which in turn shape how merger surplus is distributed and how efficiently integration is conducted [10,15,20]. When technology gaps are large, the acquirer depends more on implementation-specific human capital; local labor-market structure then affects wage pressure, retention, and restructuring speed [23,24,26]. This suggests an interaction channel from technological differences to bargaining conditions and ultimately to firm performance, rather than a fully identified mediation chain [12,16].

Accordingly, we propose the third hypothesis:

H3: Employee bargaining conditions moderate, and may partially channel, the relationship between technological distance and acquirers' post-merger long-run performance.

4. Empirical Strategy and Data

4.1 Empirical Model

Core empirical model is a triple-difference specification designed to test whether the post-merger performance effect varies jointly with technological distance and employee bargaining power. The most important variable in the model is Post × TechGap × Bargain. This term captures whether the effect of technological distance on acquirer post-merger ROA is amplified or weakened when employee bargaining power is stronger.

The baseline triple-difference model is:

$$ROA_{it} = \beta4(Post_{it} \times TechGap_{i,pre} \times Bargain_{i,pre}) + \beta2(Post_{it} \times TechGap_{i,pre}) + \beta3(Post_{it} \times Bargain_{i,pre}) + \beta1\ Post_{it} + \alpha_i + \gamma_t + \varepsilon_{it}.$$

α_i denotes firm fixed effects and γ_t denotes year fixed effects. In stricter specifications, year fixed effects are replaced with industry-by-year fixed effects. The coefficient of interest is $\beta4$. A statistically significant $\beta4$ indicates that the post-merger ROA effect depends jointly on technological distance and employee bargaining power, which is the empirical counterpart of the proposed technology-gap-bargaining-performance channel.

To further evaluate the mechanism, the paper also estimates two auxiliary equations. First, employee bargaining power is regressed on pre-deal technology distance and pre-deal controls to test whether technology gaps are associated with bargaining conditions. Second, long-run ROA changes are regressed on bargaining power and the interaction between technology distance and bargaining power to examine whether the bargaining channel is reflected in post-merger performance.

The model can be written as:

$$Bargain_{i,pre} = \delta0 + \delta1\ TechGap_{i,pre} + X_{i,pre}'\delta + Industry\ FE + Deal\text{-}year\ FE + u_i;\ \Delta ROA_i = \theta0 + \theta1\ TechGap_{i,pre} + \theta2\ Bargain_{i,pre} + \theta3(TechGap_{i,pre} \times Bargain_{i,pre}) + X_{i,pre}'\theta + Industry\ FE + Deal\text{-}year\ FE + v_i.$$

We also estimate an auxiliary regression of bargaining power on pre-deal technology gap.

We interpret a statistically significant $\beta4$ as evidence that the post-merger ROA effect depends jointly on technological distance and employee bargaining power. Section 5 reports whether this coefficient is significant in the full sample and in the pandemic-adjusted sample that excludes 2020 deals.

Estimating how technological distance affects post-merger outcomes raises endogeneity concerns from omitted variables and non-random selection into deals. We address these threats with a layered identification design rather than a single exclusion restriction.

All baseline columns include firm and year fixed effects, removing time-invariant firm traits and common macro shocks. Identification therefore uses within-firm variation in post-merger performance, which limits bias from unobserved cross-sectional heterogeneity.

TechGap is measured before the transaction, so post-merger ROA cannot feed back into the acquirer–target TFP gap—alleviating reverse-causality concerns.

Interactions and heterogeneity splits further ask whether bargaining conditions align with

technology-gap ROA patterns. Given the data limits described above, this block should be read as supportive channel evidence, not as a definitive causal mediation test.

Robustness replaces the technology-gap and bargaining proxies, winsorizes ROA, restricts sample years, and runs placebo timing tests to gauge sensitivity to measurement choices and pre-existing trends.

Timing also matters for interpretation. Post flags years after deal completion, whereas technology and bargaining variables are measured before or around the event—reducing the chance that weak post-merger ROA mechanically creates the measured gap. Selection remains possible: a firm expecting decline may buy a distant target as a turnaround move, or a fast-growing firm may pursue distant deals because of strong integration capacity. Inference therefore rests jointly on within-firm comparison, fixed effects, placebos, and the robustness exercises above, not on one assumption alone.

4.2 Data

The firm-year panel merges WIND financial statements with transaction records from the Global Listed Company M&A Database. WIND supplies standardized accounts for listed firms—balance sheet and income statement items, firm characteristics, and ownership—used to build ROA, size, leverage, and other standard corporate-finance controls. The M&A file provides deal dates so annual outcomes align with acquisition events.

We retain observations with complete financial data and matched deal timing. The panel spans 2017–2024. Targets lack a separate annual panel in this release, so TechGap and bargaining-power variables are built from listed acquirers and regional labor structure; results speak to acquirer-side performance rather than a full target-side mediation design.

That constraint shapes interpretation. Richer tests would observe target employee locations, contract terms, and job transitions around each deal to see whether bargaining responds to technology gaps and mediates acquirer ROA. Here we pair acquirer–target TFP distance with regional labor measures for a feasible channel check: technology gaps, deal timing, and accounting line up in one panel, but bargaining is observed only indirectly—not as a fully traced mediation path.

4.3 Variables Definition

4.3.1Technological Distance (TechGap)

The key technology-related variable in this study is technological distance. Following the productivity literature, we construct firm-level total factor productivity (TFP) using the Levinsohn-Petrin (LP) method with Ackerberg-Caves-Frazer (ACF) correction to address simultaneity bias in production function estimation. Technological distance is defined as the absolute difference between the acquirer's TFP and the target's TFP before the acquisition. This definition directly captures the productivity gap between the two firms involved in the transaction.

$TechGap_i$ = | TFP_Acquirer,i - TFP_Target,i |.

This measure captures the technological distance between the acquiring firm and the target firm. A larger value indicates a wider gap in production efficiency, technological capability, and organizational

knowledge between the two firms before the acquisition.

4.3.2 Bargaining Power

The main channel variable is employee bargaining power. Following the idea that labor market dependence reflects outside options and negotiation strength, bargaining conditions are proxied using local labor-market concentration. The empirical tables use the inverse concentration measure, Bargain = 1-HHI, so higher values correspond to stronger employee bargaining conditions.

Formally, we construct:

$$BargainingPower_i = GeographicConcentration_{Employees}$$

Higher values of the concentration index indicate more concentrated labor distribution and thus weaker outside options. In the regressions, the inverse measure 1-HHI is used so that higher Bargain values indicate stronger bargaining power.

The economic interpretation of this proxy is straightforward. When local employment is concentrated among a small number of employers, employees may have fewer outside options, and the firm may face less labor-market pressure. Conversely, when employment is dispersed across many employers, employees can more easily move across firms, which increases their outside options and bargaining strength. Recent evidence on digital transformation and firm bargaining power also suggests that technology can reshape bargaining positions by changing information flows, outside opportunities, and innovation capabilities [27]. This makes local labor-market structure a useful, although imperfect, empirical proxy for the bargaining environment surrounding technology-related integration.

4.3.3 Post-Merger Performance

The dependent variable is post-merger operating performance, measured by return on assets (ROA). Following standard practice in the M&A literature, we compute ROA over a multi-year window after deal completion to capture long-run performance effects rather than short-term market reactions.

$$ROA_{i,t+1:t+k}$$

where k captures the post-merger horizon.

4.3.4 Control Variables

We include standard firm-level controls where data are available, including ln(Assets) and ln(Employment). HHI enters the analysis as the concentration index underlying Bargain (=1−HHI), and EmpShare is used as an alternative labor-market proxy in robustness checks. For heterogeneity analysis, HighTech and HighBargain are median-split indicators of TechGap and Bargain, and the regressions use Post × HighTech, Post × HighBargain, and Post × HighTech × HighBargain. For mechanism evidence, TechGap × Bargain and ΔROA are used, where ΔROA = mean(ROA_{t+1}, ROA_{t+2}, ROA_{t+3}) − ROA_{t−1}. For the endogeneity diagnostic in Section 5.2, FakePost replaces Post in the two pre-deal years and enters the same interaction structure (FakePost × TechGap, FakePost × Bargain, and FakePost × TechGap × Bargain). The main specifications include firm and year fixed effects, and stricter specifications replace year fixed effects with industry-by-year fixed effects.

Table 1. Core variable Definitions

Variable	Definition	Notes
ROA	Return on assets (percentage points)	Dependent variable; baseline uses 1%–99% winsorized ROA
Post	Equals 1 in deal year and thereafter for acquirers; 0 otherwise	Non-M&A firms always coded as 0
FakePost	Equals 1 in the two years before deal completion for acquirers; 0 otherwise	Placebo timing indicator used only in Section 5.2
TechGap	|TFP_Acquirer − TFP_Target| using LP-ACF TFP at t−1	Absolute pre-deal productivity distance
HHI	Industry–region–year employer concentration index	Higher HHI = more concentrated local labor market
Bargain	1 − HHI	Higher Bargain = stronger employee outside options / bargaining conditions
EmpShare	Firm employment share in the industry–region–year cell	Alternative bargaining-related proxy in robustness
ln(Assets)	Natural log of total assets	Firm-size control
ln(Employment)	Natural log of employment	Employment-size control
Post × *TechGap*	Interaction of Post and TechGap	Baseline double interaction
Post × *Bargain*	Interaction of Post and Bargain	Baseline double interaction
Post × *TechGap* × *Bargain*	Triple interaction of Post, TechGap, and Bargain	Core coefficient β4 in Section 4.1
FakePost × *TechGap*	Interaction of FakePost and TechGap	Placebo analogue of Post × TechGap
FakePost × *Bargain*	Interaction of FakePost and Bargain	Placebo analogue of Post × Bargain
FakePost × *TechGap* × *Bargain*	Triple interaction of FakePost, TechGap, and Bargain	Placebo analogue of β4; should be insignificant if pre-trends are weak
HighTech	Equals 1 if TechGap above sample median; 0 otherwise	Used in heterogeneity / binary interactions
HighBargain	Equals 1 if Bargain above	Used in heterogeneity / binary

	sample median; 0 otherwise	interactions
Post × *HighTech*	Interaction of Post and HighTech	Heterogeneity specification
Post × *HighBargain*	Interaction of Post and HighBargain	Heterogeneity specification
Post × *HighTech* × *HighBargain*	Triple interaction of Post, HighTech, and HighBargain	Binary triple-difference in heterogeneity analysis
TechGap × *Bargain*	Interaction of TechGap and Bargain	Used in the cross-sectional mechanism equation
ΔROA	mean(ROA_{t+1}, ROA_{t+2}, ROA_{t+3}) − ROA_{t−1}	Long-run ROA change in mechanism and quadrant tables

Note. This table defines all variables used in the baseline, placebo, robustness, heterogeneity, and mechanism analyses. Later sections do not introduce variables outside this list.

Table 2. Descriptive Statistics

Variables	Obs	Mean	SD	Min	Max
ROA	110,067	2.509	19.715	-3278.175	1246.762
Post	110,080	0.037	0.189	0.000	1.000
TechGap	926	0.070	0.108	0.000	0.990
Bargain	110,080	0.953	0.084	0.000	0.996
HHI	110,080	0.047	0.084	0.004	1.000
EmpShare	110,080	0.011	0.061	0.000	1.000
ln(Assets)	110,080	19.582	2.725	4.639	27.225
ln(Employment)	110,080	6.905	2.248	0.000	14.648

Note. ROA is measured in percentage points. TechGap is defined as |TFP_Acquirer − TFP_Target| using LP-ACF TFP at t−1. Bargain is measured as 1−HHI. EmpShare, ln(Assets), and ln(Employment) are defined in Table 1 and used as controls or alternative proxies.

Table 1 reports the definitions of all variables used in the subsequent empirical analysis. Table 2 reports descriptive statistics for these variables. The TWFE sample contains 110,080 regression observations and 926 M&A acquirers with matched target TFP for TechGap. The median technology-gap measure is 0.0274, and the median bargaining-power measure is 0.9766, corresponding to a low median HHI of 0.0234. These statistics indicate substantial variation in technology distance and local labor-market structure across the sample.

5. Empirical Results

5.1 Baseline Results

We estimate the relationship between technological distance and post-merger ROA using firm and year fixed effects. This specification absorbs time-invariant firm characteristics and common macroeconomic shocks, so identification comes from within-firm variation over time.

Table 3. Baseline Results

	(1)	(2)	(3)	(4)
VARIABLES	ROA	ROA	ROA	ROA
Post	-0.333	-0.534**	-0.328	-0.321
	(0.211)	(0.214)	(0.211)	(0.234)
Post × TechGap	0.218	0.322	0.204	0.528**
	(0.204)	(0.209)	(0.204)	(0.246)
Post × Bargain	-0.109	-0.206*	-0.015	-0.311*
	(0.118)	(0.123)	(0.128)	(0.167)
Post × TechGap × Bargain	0.030	0.006	0.040	0.138*
	(0.057)	(0.056)	(0.062)	(0.073)
Observations	110,067	110,067	110,067	108,531
Fixed effects	Firm + Year	Firm + Year	Firm + Industry-Year	Firm + Year

Note. The dependent variable is ROA, winsorized at the 1st and 99th percentiles. Standard errors are reported in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

The key technology variable in the reported panel estimates is TechGap, measured as the absolute difference between acquirer TFP and target TFP before the acquisition. This measure captures ex ante technology-related heterogeneity rather than post-merger outcomes, which helps alleviate concerns regarding reverse causality.

Table 3 reports the baseline estimates for ROA winsorized at the 1st and 99th percentiles. Post is negative in the controlled specification, and the triple interaction becomes significant when 2020 deals are excluded. Raw-ROA estimates are reported as robustness checks.

Post × Bargain is negative and significant with firm-scale controls. Stronger employee outside options may raise wage pressure or slow restructuring, although Bargain may also proxy for local integration difficulty. Because the full-sample triple interaction is not robust, the evidence supports moderation rather than complete mediation.

ROA is measured in percentage points, so a persistent decline of roughly half a percentage point can be

economically important for firms with large asset bases. ROA nevertheless captures only realized operating outcomes; technological capability, market position, and innovation benefits may emerge later.

Three mechanisms may explain the estimates. Larger technology gaps raise the costs of combining assets, routines, and tacit knowledge. They may also delay restructuring and operational consolidation. Finally, technological dependence can alter the parties' outside options and bargaining positions, allowing labor-market conditions to affect integration costs and long-run profitability.

Post × TechGap × Bargain is not robustly significant in the full sample but becomes significant when 2020 deals are excluded. Thus, the pandemic-adjusted estimates support the proposed moderation channel, whereas the full-sample evidence remains weaker.

Nevertheless, the findings in this section provide an empirical foundation for the subsequent analysis. They indicate that technology-related differences are economically relevant for post-merger outcomes and motivate a deeper investigation into heterogeneity and robustness patterns.

5.2 Endogeneity

A central identification concern is that firms do not randomly select into M&A transactions. Firms that pursue technologically distant acquisitions may differ from other firms in managerial ability, financing capacity, growth opportunities, or pre-existing performance trends. The empirical design addresses these concerns in several ways. First, firm fixed effects absorb time-invariant differences across firms, while year fixed effects absorb aggregate shocks. Second, the main technology and bargaining variables are measured before or around the transaction event, which reduces mechanical reverse causality from post-merger performance to the measured treatment variables. Third, stricter specifications use industry-by-year fixed effects to control for time-varying industry shocks that may simultaneously affect acquisition activity and ROA.

Table 4 reports the placebo timing test. Column (1) uses FakePost, equal to one in the two years before deal completion, and interacts it with TechGap and Bargain in the same way as the baseline model. The placebo triple interaction FakePost × TechGap × Bargain is statistically insignificant (−0.084, s.e. = 0.127). Column (2) reports the corresponding baseline Post interactions for comparison. This pattern reduces concerns that the main estimates are driven by differential pre-existing trends. Nevertheless, the diagnostic is not equivalent to a fully exogenous research design. The results should be interpreted as fixed-effects panel evidence and suggestive channel evidence rather than as a complete causal decomposition.

Table 4. Identification Diagnostics: Placebo Timing versus Baseline

	(1)	(2)
VARIABLES	Placebo: FakePost	Baseline: Post
FakePost / Post	0.212	-0.333

	(0.270)	(0.211)
FakePost × TechGap / Post × TechGap	-0.409	0.218
	(0.357)	(0.204)
FakePost × Bargain / Post × Bargain	0.129	-0.109
	(0.136)	(0.118)
FakePost × TechGap × Bargain / Post × TechGap × Bargain	-0.084	0.030
	(0.127)	(0.057)
Observations	110,067	110,067
Firm FE + Year FE	Yes	Yes

Note. Column (1) replaces Post with a fake pre-deal Post indicator equal to one in the two years before deal completion (FakePost). Column (2) reports the corresponding baseline Post interactions from Table 3, column (1). Standard errors are clustered at the firm level and reported in parentheses. *** p<0.01, ** p<0.05, * p<0.1. The placebo triple interaction is statistically insignificant, which reduces concerns about differential pre-trends.

5.3 Robustness

Table 5 reports robustness checks that place the raw-ROA specifications outside the main regression table and compare them with the winsorized results. The table shows that the triple interaction is insignificant in the full raw-ROA sample but becomes significant when 2020 deals are excluded, both in raw and winsorized specifications.

Table 5. Robustness Checks: Raw ROA and Pandemic-Adjusted Specifications

Robustness check	**Model**	**Variable**	**Coefficient**	**Std. error**	**P-value**	**N**	**Interpretation**
Raw ROA baseline triple interaction	TG1	Post × TechGap × Bargain	0.007	(0.068)	0.9155	110,067	Not significant
Raw ROA with size controls	TG2	Post × TechGap × Bargain	-0.040	(0.123)	0.7463	110,067	Not significant
Raw ROA	TG3	Post ×	0.021	(0.070)	0.7652	110,067	Not significant

with industry-year FE		TechGap × Bargain					
Raw ROA excluding 2020 deals	TG4	Post × TechGap × Bargain	0.135*	(0.076)	0.0771	108,531	Significant at 10%
Winsorized ROA excluding 2020 deals	W4	Post × TechGap × Bargain	0.138*	(0.073)	0.0571	108,531	Significant at 10%

Note. Significance levels follow *** p<0.01, ** p<0.05, * p<0.1. The placebo timing test is reported separately in Table 4.

5.3.1 Alternative Measure of Technological Distance

The target-based TechGap measure directly implements |TFP_Acquirer − TFP_Target|. The full-sample triple interaction remains weak, while the pandemic-adjusted specification is significant. This supports the relevance of technology distance but also shows that inference is specification-sensitive.

5.3.2Alternative Definition of Bargaining Power

Alternative bargaining proxies produce mixed results: HHI is insignificant, whereas EmpShare is significant at the 5% level. Labor-market structure therefore matters, but each proxy captures the underlying bargaining environment imperfectly.

Because bargaining power is not directly observable, this mixed evidence is important. It suggests that bargaining conditions may matter, but the empirical proxy should be interpreted as an imperfect measure of the underlying channel.

5.3.3 Alternative Post-Merger Performance Window

The triple interaction is insignificant in the full sample and the 2019–2021 deal window, but becomes significant when 2020 deals are excluded in both raw- and winsorized-ROA specifications. Pandemic shocks may therefore mask the underlying relationship; winsorization itself does not overturn it.

The robustness tests are useful because each alternative specification addresses a different empirical concern. Alternative technology-gap measures assess whether the result depends on one particular productivity metric. Winsorization addresses the concern that extreme ROA observations drive the estimates. Excluding 2020 deals is important because the pandemic period created unusual shocks to profitability, labor mobility, and acquisition timing. The placebo test is especially important for the difference-in-differences interpretation: if the fake pre-event interaction were significant, it would suggest that treated firms already followed different trends before the acquisition. The insignificant placebo result strengthens the credibility of the post-event interpretation, even though it does not by

itself prove the mechanism.

5.3.4 Excluding Large Deals / Outliers

Overall, the robustness checks support the relevance of technology distance while leaving the bargaining-power evidence conditional. The results are consistent with moderation, not conclusive full mediation.

5.4 Heterogeneity Analysis

Table 6 examines whether the post-M&A ROA effect differs across subsamples defined by employee bargaining power and technological distance. Because Table 3 uses continuous interaction terms while Table 6 uses median-split subsamples, the two tables should not be interpreted as mechanically identical tests. The heterogeneity results are used to describe cross-group performance patterns rather than to overturn the continuous triple-difference estimates.

Table 6. Heterogeneity by Bargaining Power and Technology Gap

	(1)	(2)	(3)	(4)	(5)
VARIABLES	ROA	ROA	ROA	ROA	ROA
Post	-0.704	-0.336	-0.898**	-0.156	0.023
	(0.480)	(0.273)	(0.445)	(0.333)	(0.334)
Post × *HighTech*					-0.733
					(0.487)
Post × *HighBargain*					-0.346
					(0.628)
Post × *HighTech* × *HighBargain*					-0.015
					(1.046)
Observations	106,395	106,331	106,371	106,355	110,067
Fixed effects	Firm + Year	Firm + Year	Firm + Year	Firm + Year	Firm + Year

Note. Standard errors are reported in parentheses. The split-sample results should be interpreted as heterogeneity evidence.

5.4.1 Heterogeneity by Employee Bargaining Power and Technology Gap

Splitting the sample by technology gap shows a clearer post-merger ROA decline among HighTech acquirers, which is consistent with the subsample pattern emphasized in the abstract and conclusion. By contrast, splitting the sample solely by employee bargaining power yields weaker evidence, since

neither bargaining-power subgroup exhibits a clearly significant post-merger effect. The subgroup evidence is useful for interpreting heterogeneity, but it should not be used by itself to establish the bargaining-power mechanism.

The binary interaction specification also does not show a significant triple interaction, which reinforces the need for a cautious interpretation of the bargaining-power channel.

This mixed pattern provides a useful lesson for the interpretation of technology-related M&A. Technological distance appears to matter, but its effect is not well summarized by a simple high-versus-low bargaining split. Large technology gaps can generate potential gains from knowledge transfer, yet they can also create integration costs and dependence on specialized workers. Whether the net effect is positive or negative depends on the acquirer's absorptive capacity, the target's human capital, and the local labor-market environment. This interpretation is consistent with studies showing that technological relatedness, centrality in the knowledge network, and bilateral spillovers jointly affect acquisition incentives and post-merger innovation outcomes [13,20].

5.4.2 Quadrant Descriptive Evidence

Table 7 reports descriptive statistics for the four quadrants formed by HighTech and HighBargain (median splits defined in Table 1). The table helps interpret the economic meaning of the interaction between technological distance and employee bargaining conditions.

Table 7. Descriptive statistics by HighTech and HighBargain Quadrants

Quadrant	N	Mean ΔROA	Median ΔROA	Mean pre-deal ROA	Mean TechGap	Mean Bargain	Mean HHI
HighTech=0 × *HighBargain=0*	159	-0.432	-0.445	3.967	0.014	0.938	0.062
HighTech=0 × *HighBargain=1*	154	-1.660	-0.912	4.366	0.015	0.987	0.013
HighTech=1 × *HighBargain=0*	173	-1.524	-1.134	4.151	0.065	0.937	0.063
HighTech=1 × *HighBargain=1*	179	0.379	-0.807	3.899	0.070	0.987	0.013

Note. Quadrants are defined by the median splits HighTech and HighBargain in Table 1. This table reports descriptive statistics for the mechanism cross-section and should not be interpreted as causal evidence.

The quadrant evidence should be read as descriptive rather than causal. It shows meaningful differences across groups, but the mean and median changes in ROA do not by themselves establish a monotonic

mediation pattern.

The descriptive quadrant table also helps explain why the paper avoids overclaiming. The HighTech=1 × HighBargain=1 group has a positive mean change in ROA but a negative median change, indicating that the average is influenced by right-tail observations. This suggests heterogeneity within the group and cautions against interpreting the mean as a representative effect. The HighTech=1 × HighBargain=0 group shows a more negative average and median change, which is consistent with the idea that technology gaps can be costly when firms lack favorable bargaining or implementation conditions. However, because these statistics do not condition on fixed effects or other controls, they are best used to guide interpretation rather than to establish causality.

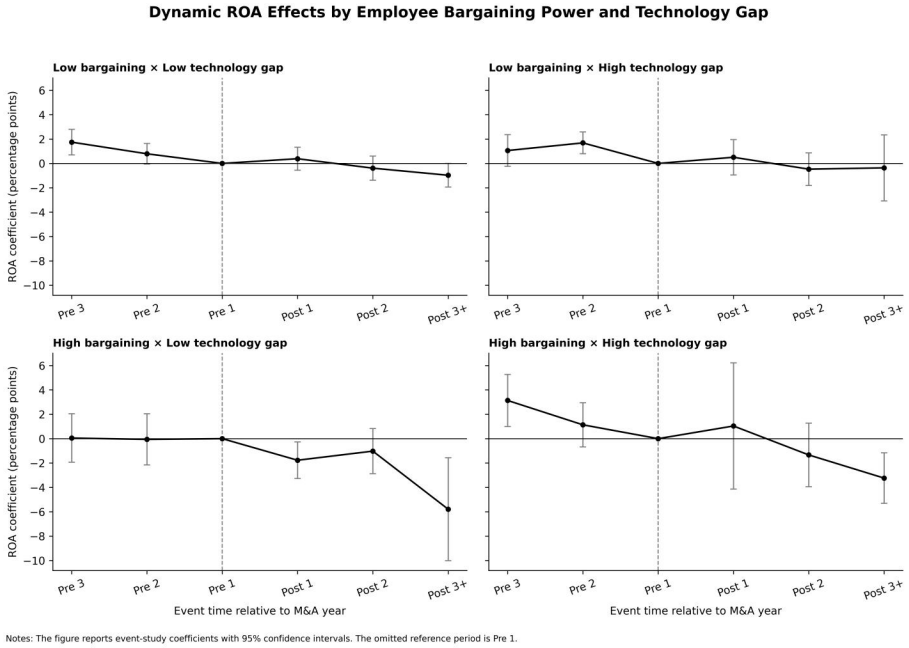

Figure 1. Dynamic ROA Effects by Employee Bargaining Power and Technology Gap

Note. The figure reports event-study coefficients for ROA relative to the pre-deal benchmark year (Pre 1). The vertical dashed line marks the acquisition event. Dots represent point estimates and vertical bars represent confidence intervals.

Figure 1 provides a dynamic complement to the heterogeneity results in Tables 6 and 7. The four panels divide acquirers by employee bargaining power and technology gap, allowing the post-merger ROA path to be compared across different combinations of bargaining conditions and technological distance. The pre-event coefficients are close to the benchmark in most panels, which provides a useful visual diagnostic for the event-study design. At the same time, the confidence intervals are relatively wide in some groups, especially when both bargaining power and technology gap are high, so the figure should be interpreted as supportive visual evidence rather than as a standalone causal test.

The post-event patterns are consistent with the main interpretation of this paper. In the high-bargaining

and HighTech group, ROA does not improve persistently after the transaction and turns negative in later post-event periods. In the high-bargaining and low-technology-gap group, the coefficients are relatively flat before the event but decline more clearly by the long-run post-event window. By contrast, the low-bargaining groups show more moderate post-merger movements, especially when the technology gap is low. These patterns suggest that technology gaps and employee bargaining conditions jointly shape the adjustment path after M&A completion: larger technological distance may create integration frictions, while stronger bargaining conditions may affect the speed and cost of restructuring.

Overall, the event-study evidence strengthens the argument that the bargaining-power channel should be viewed as heterogeneous and dynamic. It does not show a uniform deterioration across all groups. Rather, the decline is concentrated in specific combinations of technology distance and bargaining conditions. this supports the paper's cautious conclusion that employee bargaining conditions provide suggestive channel evidence, but that the mechanism should not be interpreted as conclusive proof of full mediation.

5.5 Mechanism

The mechanism proposed in this paper is that technology gaps affect post-merger operating outcomes partly through the bargaining environment surrounding employees and implementation-specific knowledge. Table 8 reports the two auxiliary channel equations formally introduced in Section 4.3. These estimates are included to avoid separating the empirical model from the reported results. In Table 8, ΔROA is the long-run ROA change defined in Table 1.

Table 8. Mechanism: Technology Gap, Bargaining Power and Long-run ROA

VARIABLES	Bargain	ΔROA	ΔROA
TechGap	0.011		0.282
	(0.016)		(0.264)
Bargain		0.004	-0.015
		(0.255)	(0.321)
TechGap × Bargain			-0.052
			(0.357)
Controls	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes
Deal-year FE	Yes	Yes	Yes
Observations	663	663	663

Note. Controls include pre-deal ROA, firm size, employment size, market structure, industry fixed effects, and deal-year fixed effects. Standard errors are clustered at the firm level. *** p<0.01, ** p<0.05, * p<0.1.

At the same time, the mechanism evidence remains limited. The auxiliary equations do not show a significant direct mediation pattern in the cross-sectional specification, while the triple interaction is significant only in the pandemic-adjusted panel specification. The paper does not claim to identify a full mediation chain. A more accurate interpretation is that employee bargaining conditions provide suggestive moderation evidence for why technology gaps may translate into heterogeneous post-merger performance.

6. Conclusions and Policy Implications

This paper examines whether technological distance helps explain acquirers' post-merger operating performance and whether employee bargaining power is a channel through which this relationship operates. Using a matched listed-firm panel and M&A event information, the analysis links annual financial outcomes to deal timing through baseline fixed-effects regressions, heterogeneity tests, and robustness checks.

The empirical results provide several findings. First, acquirers tend to experience lower ROA after M&A completion. Second, the post-merger decline is more visible in the HighTech subsample, while continuous Post × TechGap estimates remain sensitive to specification. Third, the triple interaction Post × TechGap × Bargain is not robustly significant in the full sample, but becomes significant when 2020 deals are excluded. The evidence supports a bargaining-power moderation channel, but it should not be interpreted as conclusive proof of full mediation.

Overall, these findings suggest that the economic consequences of mergers and acquisitions cannot be fully understood without considering technology-related integration costs and labor-market frictions. Bargaining conditions may shape how technology-related adjustment is reflected in long-run operating performance. For acquiring firms, technology gaps should be treated not only as potential sources of synergy, but also as sources of adjustment costs during post-merger integration. For policymakers, labor-market structure may influence how the gains and costs of corporate control transactions are realized. These implications are especially relevant to digital-platform and inter-sectoral acquisitions, where transactions can alter investment incentives, corporate power, and production networks[28,29,30].

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