

Innovation and Learning for Sustainable Competitive Advantage: An Empirical Analysis of China as a Developing Economy

Zhong Ye Sun
City University, Malaysia

Abstract: This thesis investigates how organizational learning capability (OLC) affects sustainable competitive advantage (SCA) of Chinese listed firms. Using panel data of 491 A share non financial firms from 2010 2022, it examines direct impacts, innovation based mediation and moderating roles of firm age and state ownership. Results show OLC positively influences SCA with differentiated innovation mechanisms, and this effect is stronger in older and state owned firms, offering managerial and policy implications.

Keywords: Organizational Learning Capability; Sustainable Competitive Advantage; China; Corporate Innovation; Panel Data

1. Introduction

Chapter 1 sets out the research background, practical puzzles, problem statement, three core research questions, research objectives, study scope, theoretical practical significance, operational variable definitions, and overall thesis structure for this doctoral study, which explores the link between organisational learning capability (OLC) and sustainable competitive advantage (SCA) within the context of developing economy China.

To begin with, the chapter illustrates that superior corporate performance at one point in time cannot guarantee lasting competitiveness. Firms dominating an industry may lose their edge amid technological shifts, changing customer demands and transformed competitive rules. By contrast, resource constrained enterprises can achieve progress through faster learning and more effective knowledge re organisation. This phenomenon is especially prominent in China. Driven by industrial upgrading, digital transformation and shifting institutional environments, the foundations of corporate competition have kept changing rapidly. Organisational learning capability serves as a feasible organisational response, referring to firms' capacity to acquire, integrate, retain and apply knowledge across staff and managers. Sustainable competitive advantage, the core dependent variable, means enduring superior performance instead of short term favourable outcomes, and it must survive external shocks and competitive pressures.

Practically, researchers encounter major observational obstacles in archival datasets. Organisational learning is mostly measured via cross sectional surveys, while competitive advantage is commonly proxied by concurrent profitability. Such measurement approaches create several drawbacks: scholars can hardly track within firm shifts in learning capacity, verify whether performance gains can endure, or identify specific innovation pathways behind such effects. Besides, reverse causality cannot be ruled out: better performing firms have more resources to invest in learning activities, and unobserved firm specific factors may simultaneously shape both OLC and SCA. Furthermore, the OLC SCA correlation may vary under diverse organisational and institutional circumstances. Against these challenges, the thesis adopts longitudinal indicators to separate firm level learning capacity from subsequent persistent industry relative profitability.

This research carries three dimensional significance. Theoretically, it integrates the resource based view, knowledge based view, organizational learning theory, absorptive capacity theory and dynamic capabilities theory into one unified analytical framework centring on knowledge conversion into sustained performance. Empirically, it develops an observable annual firm level OLC indicator and tests direct, mediating and contingent relationships on a consistent sample. Practically, it clarifies that investments in educated staff, technically oriented managers, innovation inputs and innovation outputs cannot be treated as interchangeable paths toward long term competitive strength. Its empirical findings can offer references for managers allocating learning related resources, as well as policymakers formulating policies supporting industrial upgrading, human capital development and corporate innovation.

Three clear research questions are proposed accordingly. First, what influence does organisational learning capability exert on sustainable competitive advantage for Chinese listed firms? Second, how does OLC shape SCA via innovation related mechanisms? Third, whether firm age and state ownership moderate the OLC SCA relationship. Correspondingly, three research objectives are established: to estimate the OLC effect on SCA, to identify innovation transmission channels between the two constructs, and to assess whether firm age and state ownership alter such effects.

The study scope is clearly defined. The sample consists of non financial Chinese A share listed enterprises. The balanced panel covers 491 firms spanning 2010 to 2022, generating 6,383 firm year observations. Firm year serves as the unit of analysis, and all raw data derive from the CSMAR database, covering corporate fundamentals, financial statements, employee composition, managerial backgrounds, ownership attributes, R&D spending and patent statistics. Substantively, this thesis focuses on firm level learning capacity and persistent competitive performance. It investigates intra firm changes, controls for common annual macro level shocks, and applies the identical balanced dataset for all three research questions and structural equation modelling.

The chapter provides detailed operational definitions for key constructs. Organisational learning capability is calculated as the equally weighted average of annually standardised proportion of higher educated employees and proportion of managers with technical backgrounds. It acts as a dimensionless archival proxy capturing human and managerial foundations of organisational learning, though it cannot fully reflect learning culture or internal behavioural routines. Sustainable competitive advantage is operationalised as the average industry adjusted return on assets over the next three years. It measures medium term performance persistence rather than permanent competitive superiority or environmental sustainability. Other core variables are also specified: technological innovation output is represented by logged domestic patent applications; R&D intensity means R&D expenditure divided by operating revenue; highly educated human capital refers to the share of higher educated employees; invention patent grants use logged counts of approved domestic invention patents; firm age equals the observation year minus corporate founding year; state ownership is a dummy variable distinguishing state owned enterprises from private firms. Standard control variables include firm size, leverage, revenue growth, cash holdings and book value based Tobin's Q.

The background section further elaborates global and Chinese contextual realities. Globally, sustaining competitive advantage constitutes a lasting strategic challenge. Technology diffusion, competitor imitation, shifting customer expectations and regulatory adjustments constantly erode existing competitive edges. Economic volatility, fluctuating cross border trade and foreign investment exposure force companies to continuously adjust strategies. Superior performance seldom lasts long, and persistent outperformance belongs to only a small minority of corporations worldwide.

For Chinese domestic context, after China's WTO accession, local firms experienced fast industrial transformation, digitalisation, rising R&D expenditure and explosive patent growth. Meanwhile, industrial policies, financial supervision, ownership reforms and intellectual property regimes kept evolving. Firms must pursue organisational renewal amid rapid institutional transition. Nevertheless, higher R&D spending and more patent filings do not automatically translate into lasting profits. Policy driven innovation inputs may turn into symbolic activities instead of commercial value creation. In addition, state owned and private firms differ greatly in resource access, incentive structures, while regional gaps in innovation infrastructure also generate heterogeneous corporate outcomes.

The thesis stresses that OLC works as a critical organisational lever. Higher educated employees expand corporate knowledge reservoirs, while technically trained managers help identify and evaluate technical opportunities. Neither resource alone guarantees effective organisational learning. Real OLC materialises only when firms connect distributed specialist knowledge with strategic decision making, trial and error experiments and practical implementation. Moreover, reciprocal effects exist: stronger persistent profitability can supply extra capital for recruiting educated employees and technical managers, hence improving subsequent OLC. That explains why the thesis adopts firm fixed effects, time ordered variable design and instrumental variable tests to handle reverse causality concerns. Innovation functions as the core intermediate mechanism linking OLC and SCA, covering multiple sequential phases: R&D resource commitment, human capital embedding, patent applications and officially authorised invention patents. Firm age produces dual forces: accumulated experience, organisational memory and complementary assets may amplify learning returns, yet organisational inertia may also block knowledge renewal. Similarly, state ownership brings patient capital and policy information, but may also introduce multi objectives and bureaucratic restraints, making moderation an empirical question requiring quantitative verification.

Finally, Chapter 1 outlines the overall thesis layout. Chapter 2 conducts literature review and constructs the theoretical framework. Chapter 3 introduces datasets, variable measurements and econometric methodologies. Chapter 4 presents descriptive statistics, regression outputs, mediation, moderation, diagnostic checks, instrumental variable robustness tests and heterogeneity analysis. Chapter 5 discusses major findings, puts forward policy and managerial implications, acknowledges research limitations and proposes directions for follow up studies. In general, Chapter 1 builds a complete introductory foundation, clarifying research motivation, contextual background, core puzzles, research design, variable definitions and full text structure for this doctoral dissertation.

2. Literature review

Chapter 2 presents an extensive literature review, identifies critical research gaps, reviews foundational theories, and develops the integrated theoretical framework and testable hypotheses for this doctoral research examining organisational learning capability (OLC) and sustainable competitive advantage (SCA).

This chapter opens with a review of existing scholarship on sustainable competitive advantage (SCA). Within strategic management scholarship, SCA is defined as persistent superior relative performance that persists despite imitation, substitution, market turbulence, and competitor retaliation; this construct is conceptually distinct from environmental sustainability (Barney, 1991; Wiggins & Ruefli, 2002). Researchers have deployed three primary measurement strategies: perceptual survey scales, market based valuation indicators, and accounting based performance metrics. Perceptual measures capture managers' subjective evaluations yet are vulnerable to common method bias. Market based indicators reflect investor expectations but can be distorted by market sentiment. Accounting based metrics, particularly multi period industry adjusted profitability, are well suited for longitudinal archival research because they capture realised operational outcomes and enable assessments of performance persistence (Baaij et al., 2004). Literature syntheses indicate that enduring superior firm performance is empirically uncommon. Even valuable organisational resources cannot guarantee sustained economic rents; temporary market booms or protective policy arrangements may produce short run profits without establishing genuine isolating mechanisms that defend competitive position. Documented antecedents of SCA encompass strategic resources, dynamic capabilities, corporate governance, financing conditions, and institutional contexts. Innovation outputs alone do not equate to competitive persistence, as innovation inputs and outputs are not automatically converted into appropriable economic value (Hagedoorn & Cloudt, 2003). Accordingly, the present study adopts forward looking industry adjusted return on assets as a proxy for medium term SCA instead of relying on contemporaneous profit figures or patent derived metrics.

Next, the chapter elaborates the construct of organisational learning capability (OLC). Organisational learning constitutes a multilevel process that includes knowledge acquisition, distribution, interpretation, retention, and behavioural modification (Huber, 1991; Crossan et al., 1999). This process extends beyond individual employees' personal expertise: individual knowledge becomes an organisational asset only through cross level integration and institutionalised routines. OLC refers to the repeatable organisational capacity to enact these learning workflows (Jerez Gómez et al., 2005). Although conceptually overlapping with related constructs, OLC is distinguishable from learning orientation, learning culture, and absorptive capacity. Learning orientation emphasises organisational values that prioritise learning; absorptive capacity centres on recognising and utilising externally generated knowledge; OLC encompasses both internal knowledge generation and the absorption of outside information (Cohen & Levinthal, 1990).

Two foundational tensions run through organizational learning scholarship: the trade-off between exploration and exploitation, and the dual consequences of organisational memory (March, 1991). Exploration involves risky search and experimentation to pursue novel possibilities, which yields delayed, uncertain returns. Exploitation focuses on refining existing routines to realise near term operational efficiency. Overreliance on exploitation creates competency traps, whereas excessive exploration consumes finite organisational resources without delivering immediate pay-offs. Organisational memory preserves accumulated experience via formal procedures and shared collective understandings; simultaneously, memory may generate organisational inertia by perpetuating obsolete assumptions.

Scholarly traditions for measuring OLC fall into two categories. Survey based multidimensional scales can directly capture learning culture, managerial commitment, and knowledge sharing behaviours, yet these instruments typically produce cross sectional data ill suited for long term firm year panel analysis (Jerez Gómez et al., 2005). Archival proxies sacrifice direct observation of behavioural and cultural dimensions but permit longitudinal tracking of firm level change. This thesis employs a formative composite index built from two observable organisational foundations: the share of highly educated employees and the proportion of managers holding technical professional backgrounds. Annual equal standardisation eliminates variance driven weighting of components. The author explicitly acknowledges that this archival proxy captures only human resource related foundations of OLC and cannot fully measure psychological safety, internal communication norms, or informal experimental routines.

Subsequently, the chapter reviews empirical and theoretical literature addressing how OLC shapes SCA, covering direct, indirect, and moderating effects. For the direct effect, theoretical reasoning anticipates a positive association: OLC improves firms' capacity to recognise market signals, integrate distributed knowledge, and implement adaptive organisational renewal (Teece et al., 1997). Even so, beneficial performance outcomes are not automatic. Learning related activities incur recruitment, experimentation, and coordination costs; technically oriented managers may advocate for excessively complex projects; organisational inertia can neutralise the value of newly acquired knowledge. Prior empirical evidence remains

fragmented. Survey based studies of small- and medium sized enterprises generally support positive OLC performance associations, while archival research on listed firms frequently uses R&D expenditure, patent metrics, or executive characteristics as imperfect proxies for OLC. Many existing studies rely on cross sectional research designs or contemporaneous performance outcomes and overlook performance persistence over time (Migdadi, 2019). This body of work provides the theoretical foundation for Hypothesis 1, which posits that OLC is positively associated with SCA among Chinese listed firms.

For indirect (mediation) effects, innovation is conceptualised as a multi-stage conversion system rather than a single undifferentiated construct. Four parallel mediators are specified: technological innovation output (measured via patent applications), R&D intensity, highly educated human capital, and invention patent grants. Technological innovation output (AllPat; patent applications) represents codified inventive output. Organisational learning enhances firms' capacity to develop patentable ideas, and patents can facilitate product differentiation and economic rent appropriation. Even so, raw patent counts measure output quantity, not commercial value (Hagedoorn & Cloodt, 2003). R&D intensity reflects financial resources committed to innovation. Greater R&D investment may expand knowledge bases and absorptive capacity, yet it generates immediate accounting costs before future benefits materialise and may produce negative short term indirect effects. Highly educated human capital represents embedded knowledge capacity; this variable partially overlaps one component of the OLC index and therefore signals capability embedding instead of a fully independent causal channel. Invention patent grants are more selective than patent applications but are subject to patent office examination lags, which weaken short term empirical detectability. A single mediator model tests the primary transmission pathway running through technological innovation output, and a parallel structural equation model evaluates offsetting or reinforcing specific indirect effects across the four mediators. Total indirect effects may become statistically non significant when positive and negative individual pathways counterbalance one another (MacKinnon et al., 2002; Preacher & Hayes, 2008).

The chapter next analyses moderating mechanisms and evaluates two prespecified moderators: firm age and state ownership. Firm age creates competing theoretical predictions. On the one hand, older firms possess richer organisational memory, accumulated complementary assets, and established stakeholder relationships that enable more effective deployment of newly acquired knowledge (experience amplification logic). On the other hand, organisational ageing fosters inertia, rigid political coalitions, and entrenched obsolete routines that obstruct knowledge renewal (inertia logic; Kaganer et al., 2023). Hypothesis 3a anticipates that the experience amplification mechanism will predominate within the balanced sample of surviving listed firms, predicting that firm age positively moderates the OLC-SCA relationship.

State ownership likewise yields competing theoretical mechanisms. State owned enterprises (SOEs) can access patient capital, policy information, and public research resources, allowing learning oriented investments sufficient time to generate returns. Conversely, multiple policy driven objectives, soft budget constraints, and bureaucratic governance may weaken market driven project selection incentives (Fang et al., 2017). Hypothesis 3b hypothesises a steeper positive OLC-SCA slope for state owned firms relative to non state owned firms. Beyond these two confirmatory moderators, supplementary heterogeneity analyses explore industry contexts, geographic regions, firm size, and board independence configurations for descriptive and robustness purposes, without developing additional confirmatory hypotheses. Relevant empirical research focused on Chinese firms demonstrates that innovation outputs are jointly shaped by ownership arrangements, regional institutional environments, financing, trade related shocks, and industrial policies (Qu & Cheung, 2023).

Following the literature synthesis, three distinct research gaps are formalised. First, existing literature generates inconsistent conclusions regarding the OLC-SCA relationship, stemming from divergent construct operationalisations, sample contexts, and temporal performance outcome horizons. Second, innovation related mediation mechanisms are typically tested in isolation; few longitudinal frameworks simultaneously disentangle innovation input, human capital embedding, patent applications, and patent grants, which conceals offsetting indirect pathways. Third, firm age and state ownership are rarely formally tested as moderators of the OLC-SCA slope within empirical studies of Chinese listed firms.

Four core theoretical perspectives are reviewed and integrated: the resource based view (RBV), knowledge based view (KBV), dynamic capabilities theory, organizational learning theory, and absorptive capacity theory. The RBV emphasises valuable, rare, imperfectly imitable, and non substitutable resources (Barney, 1991). The composite OLC index represents a path dependent combination of human and managerial resources whose strategic value stems from organisational integration, rather than merely from individual employee qualifications. The KBV conceptualises firms as institutions for integrating dispersed specialist knowledge (Grant, 1996), which explains why both highly educated employees and technically competent managers constitute indispensable OLC components. Dynamic capabilities theory highlights sensing, seizing, and reconfiguring organisational competences amid environmental change and frames OLC as a critical micro foundation for organisational renewal (Teece et al., 1997). Organisational learning theory describes multistage

knowledge processes, whereas absorptive capacity theory explains how prior knowledge shapes recognition and assimilation of external information (Cohen & Levinthal, 1990; Huber, 1991).

Drawing from these theoretical foundations, the thesis develops a unified conceptual theoretical framework and proposes three sets of hypotheses. Hypothesis 1 tests the direct positive OLC-SCA association. Hypothesis 2 anticipates a positive indirect effect mediated by technological innovation output. Hypotheses 3a and 3b posit positive moderation effects for firm age and state ownership, respectively. Firm level control variables, firm fixed effects, and year fixed effects are incorporated to absorb time invariant firm heterogeneity and shared macroeconomic shocks. The chapter concludes by emphasising that this framework describes probabilistic, context dependent associations instead of deterministic causal chains; endogeneity concerns including reverse causality necessitate follow up diagnostic and robustness checks in subsequent empirical chapters.

3. Data and Methodology

Chapter 3 details the research design of this doctoral thesis, including data sources, sample construction, operational variable definitions, econometric specifications for the three research questions, diagnostic and robustness procedures, heterogeneity analysis, as well as data availability and ethical considerations. It translates the theoretical framework developed in Chapter 2 into concrete, testable empirical models for examining the relationship between organisational learning capability (OLC) and sustainable competitive advantage (SCA).

The study draws on secondary archival data obtained from the China Stock Market & Accounting Research Database (CSMAR), a standard licensed dataset widely used for empirical research on Chinese listed corporations. Multiple CSMAR modules are combined to assemble the full dataset. These modules cover basic firm information, financial statements, employee educational profiles, top management biographical characteristics, equity ownership classification, research and development expenditure records, and domestic patent information. Each observation is linked by unique firm security codes and fiscal-year identifiers, which align human capital indicators, innovation metrics, governance features and financial performance at the firm year analytical level.

The target research population consists of non-financial A share listed firms in mainland China. Financial sector enterprises and special treatment (ST) firms are excluded, given their distinct regulatory rules and financial structures. The final analytical sample is a balanced panel containing 491 firms continuously observed from 2010 to 2022, generating 6 383 firm year observations in total. Every firm appears across all 13 sample years. This consistent sample is applied uniformly to all regressions, mediation analysis, structural equation modelling and moderation tests. Using a balanced panel eliminates sample compositional variation across different model specifications and prevents divergent results from being attributed to changes in the observed firm set. Nevertheless, this design imposes limits on external validity. The dataset does not cover privately held enterprises, newly listed firms post-2010, or delisted companies that exited the market within the research window. Thus empirical conclusions apply primarily to mature surviving listed Chinese non-financial corporations. Additional data extending to 2025 are retained to construct forward looking performance outcomes, since SCA relies on profitability figures for the three years subsequent to each focal observation year.

All key variables are clearly operationalised with explicit mathematical formulations. The dependent variable is Sustainable Competitive Advantage (SCA). Departing from conventional single period profitability measures, SCA is calculated as the average value of industry median adjusted return on assets (ROA) over the three subsequent years. This forward looking, industry adjusted metric captures medium term persistent relative profitability. It serves as a practical proxy for SCA in strategic management research and avoids confusing short run profit spikes with genuine enduring competitive superiority. Importantly, this measurement does not represent environmental or ecological sustainability.

The core independent variable is Organisational Learning Capability (OLC), a formative composite index. It is computed as the equally weighted average of two annually standardised z scores: the proportion of employees receiving higher education qualifications, and the share of managers holding technical professional backgrounds. Annual standardisation places both components onto comparable scales within each calendar year, while equal weighting avoids data driven weights that would conflate construct measurement with outcome correlation. OLC is a dimensionless archival proxy reflecting human capital and managerial foundations for organisational learning. The author reiterates that this index cannot fully capture intangible dimensions such as learning culture, psychological safety or internal knowledge sharing routines.

Four innovation related mediators are defined for mediation and structural equation modelling. First, AllPat, the proxy for technological innovation output, is the natural logarithm of one plus the count of domestic patent applications in year $t+1$. Adding one preserves zero value observations, and logarithmic transformation mitigates skewness in patent counts. Second, RD_Int (R&D intensity) is the ratio of R&D expenditure to operating revenue, measuring formal innovation resource commitment rather than realised innovation results.

Third, EduHC (highly educated human capital) equals the fraction of higher educated employees among total staff; it represents embedded knowledge resources and partially overlaps with one building block of the OLC index. Fourth, InvGrant (invention patent grants) is the natural logarithm of one plus the number of domestic invention patent grants in $t+1$, capturing a later, more selective stage of formal innovation after patent office examination.

Two moderators correspond to the third research question. Firm Age is calculated by subtracting a firm's founding year from the current accounting year, expressed in years. It simultaneously reflects accumulated organisational experience, established routines and potential organisational inertia. SOE_A is a binary dummy variable coded as one for state owned enterprises and zero for non state owned firms, sourced from CSMAR equity nature classification.

A set of standard firm level control variables is incorporated to account for confounding firm heterogeneity. These include firm size (natural log of total year-end assets), leverage ratio (total liabilities over total assets), revenue growth, cash asset ratio, and a book value based TobinQ indicator. These controls absorb differences in corporate scale, financial risk, operating expansion, liquid resource slack and book based investment opportunity proxies.

For the empirical methodology, separate econometric strategies are developed for each of the three research questions.

Research Question 1 investigates the direct influence of OLC upon SCA. A two way fixed effects panel regression model is specified, incorporating both firm fixed effects and year fixed effects. Firm fixed effects eliminate all time invariant unobserved firm specific heterogeneity such as stable corporate culture and historical endowments. Year fixed effects absorb aggregate macroeconomic shocks, regulatory reforms and industry wide annual trends shared across sample firms. Control variables are included in the regression equation, and the coefficient for OLC provides the key test for Hypothesis 1.

Research Question 2 addresses innovation driven mediation mechanisms. The thesis implements two complementary mediation approaches. The single mediator model selects technological innovation output (AllPat) as the primary mediator. It estimates three sets of equations: the first stage regression predicting the mediator from OLC and controls, the total effect regression of SCA on OLC, and the outcome regression including both OLC and the mediator. The product of coefficients method is used to compute the indirect effect and assess statistical inference, consistent with established mediation literature.

Following the single mediator analysis, an observed variable parallel structural equation model (SEM) is estimated to simultaneously evaluate all four innovation related mediators: AllPat, RD_Int, EduHC and InvGrant. This specification allows estimation of specific indirect effects for each separate innovation channel. Positive and negative individual indirect pathways may counterbalance each other, which may yield a statistically insignificant total indirect effect even if some individual mechanisms are meaningful. Multiple model fit criteria are reported, including CFI, TLI, SRMR and the coefficient of determination (CD), to evaluate how well the model reproduces observed covariance patterns. No single fit index is treated as decisive; joint interpretation across fit statistics is emphasised.

Research Question 3 concerns moderation effects of firm age and state ownership. Two distinct interaction regression models are estimated. Prior to constructing interaction terms, OLC and Age are mean centred to reduce multicollinearity. Each model contains the main effect of OLC, the moderator main effect, the interaction term, firm level controls, alongside firm and year fixed effects. The coefficient of the interaction term is the central parameter for testing Hypothesis 3a and Hypothesis 3b respectively.

Furthermore, the chapter describes diagnostic checks, robustness routines and supplementary heterogeneity analysis. Descriptive statistics, correlation matrices and variance inflation factor tests detect multicollinearity issues. Instrumental variable techniques are adopted as sensitivity analysis to mitigate endogeneity risks originating from reverse causality and time varying omitted variables. Heterogeneity examinations explore coefficient variation across industry groups, geographic regions, firm size categories and board independence subgroups. These subgroup analyses serve descriptive purposes rather than confirmatory hypothesis testing. They reveal contextual variation in the OLC-SCA association without generating new hypotheses.

Finally, the chapter addresses data availability and ethical considerations. All analysis relies on publicly licensed CSMAR secondary datasets with anonymised firm level archival records. No human subjects or primary source surveys are involved, so there are no human subject research ethical risks. All variable construction and analytical procedures are documented for reproducibility. Chapter 3 concludes by outlining the organisational flow, whereby Chapter 4 will implement these models and present the full empirical output derived from the balanced panel dataset.

4. Empirical Results

Chapter 4 presents the complete set of empirical outputs derived from the balanced panel dataset of 491 Chinese non-financial A share listed firms covering 2010-2022, totalling 6 383 firm year observations. Following the analytical plan laid out in Chapter 3, it sequentially reports descriptive statistics, correlation and multicollinearity diagnostics, benchmark regression results for Research Question 1, single mediator and multiple mediator structural equation outputs for Research Question 2, moderation outcomes for Research Question 3, diagnostic tests, instrumental variable robustness checks, and supplementary heterogeneity analysis. All estimations employ firm and year fixed effects alongside consistent firm-level controls across specifications.

Descriptive statistics summarise the distribution of the dependent variable SCA, core independent variable OLC, mediators, moderators and control variables for the pooled firm year sample. Summary metrics include mean values, standard deviations, minimum and maximum figures. SCA, measured as forward three year industry adjusted ROA, exhibits moderate variation, showing that medium term relative profitability differs considerably across sample firms. OLC, the equal weight composite index built from annually standardised employee higher education share and managerial technical background share, is centred around zero by construction. The mediators display highly skewed raw distributions; the logarithmic transformations applied to patent based variables successfully mitigate skewness. Descriptive profiles for firm age, state ownership and financial controls reflect the characteristics of this sample of surviving large scale listed enterprises.

Subsequent correlation analysis and variance inflation factor (VIF) assessments evaluate pairwise Pearson correlations among key variables and test for multicollinearity risks. Several theoretically expected correlations are observed: OLC correlates positively with innovation related mediators including patent applications and R&D intensity. Nevertheless, most VIF values remain within acceptable thresholds. No severe multicollinearity problem threatens the main regression analyses. Some moderate pairwise correlations exist, particularly between OLC and EduHC, which is anticipated given that employee educational share forms one component of the OLC composite index. This overlap receives explicit attention when interpreting the structural equation model mediation pathways.

Benchmark fixed effects regression results answer Research Question 1 regarding the direct influence of organisational learning capability on sustainable competitive advantage. Sequentially adding firm level control variables step by step, the estimation demonstrates that higher OLC is statistically and positively associated with SCA. The positive coefficient persists in magnitude and statistical significance as controls for firm size, leverage, revenue growth, cash holdings and book value TobinQ are incorporated. This finding supports Hypothesis 1. Within firm improvements in organizational learning related human and managerial foundations correspond to subsequent stronger medium term industry relative profitability. The chapter emphasises that this is an adjusted within firm association rather than definitive causal proof, given remaining potential endogeneity concerns. Interpretations focus on how enhanced OLC assists firms in recognising information, integrating knowledge and pursuing adaptive renewal under changing market and institutional conditions.

Moving to Research Question 2 on innovation based transmission mechanisms, the chapter first documents outcomes from the single mediator model with technological innovation output (AllPat, patent applications) acting as the sole mediator. The first stage result shows that OLC positively predicts subsequent patent applications. In the outcome equation containing both OLC and AllPat, technological innovation output carries a positive and statistically significant partial coefficient. The calculated indirect effect through AllPat is positive yet limited in magnitude. That means technological innovation output partially transmits the OLC-SCA relationship, consistent with the core single mediator expectation. Even after accounting for this indirect channel, a substantial direct effect of OLC on SCA remains, indicating that OLC contributes to sustained competitive advantage via additional routes beyond patent codified innovation alone.

The four mediator parallel structural equation model then unpacks the differentiated conversion process across four distinct innovation related channels: AllPat, RD_Int, EduHC and InvGrant. Specific indirect effects for each mediator reveal offsetting mechanisms. Both technological innovation output and highly educated human capital generate positive specific indirect effects. By contrast, R&D intensity yields a negative specific indirect effect within the study's medium term observation window. This negative pathway is explained by the immediate financial costs of R&D investment, experimental risks and delayed pay-offs for exploratory innovation activities. Meanwhile, the formal invention patent grant channel does not deliver a statistically distinguishable indirect effect, which is attributable to administrative examination lags and timing mismatch between learning capacity shifts and granted patent outcomes. Owing to these counter-balancing positive and negative specific indirect pathways, the aggregate total indirect effect for all four mediators combined is statistically insignificant, notwithstanding meaningful individual channel results. Multiple fit indices including CFI, TLI and SRMR are reported for assessing SEM performance; the model achieves acceptable overall fit. The chapter stresses that treating innovation as a monolithic construct would obscure these divergent empirical pathways.

For Research Question 3 concerning moderating effects of firm age and state ownership, two separate interaction term fixed effects regressions are estimated. Mean centring is applied before generating interaction products to mitigate multicollinearity. Results show that the positive OLC-SCA relationship becomes significantly stronger as firm age rises. In addition, the OLC effect is significantly more pronounced among state owned firms compared with non state owned counterparts. These empirical findings support both Hypothesis 3a and Hypothesis 3b. For older listed firms, accumulated routines, organisational memory and complementary assets enable them to make better use of improved learning related capacity. For state owned enterprises, relatively patient capital, policy relevant information and complementary institutional resources allow learning investments to bear fruit for persistent relative profitability. The author clarifies that this moderation describes differences in the marginal return of OLC, and it does not imply that SOEs or older firms always possess higher absolute levels of SCA.

The chapter proceeds to multiple diagnostic sensitivity tests. Temporal sensitivity checks assess whether benchmark regression results are robust to alternative sample time window configurations. Further specification diagnostics examine the influence of variable construction choices on coefficient stability. Afterwards, instrumental variable (IV) sensitivity analysis is implemented to alleviate endogeneity threats stemming from reverse causality and time varying omitted variables. Lagged OLC serves as the instrumental variable. IV estimates retain a positive sign for the focal OLC coefficient. Even so, the study acknowledges that the economic exclusion restriction for lagged OLC cannot be conclusively proven, so IV outputs are treated as supporting sensitivity evidence rather than definitive causal identification.

Supplementary heterogeneity analysis investigates variation of the OLC-SCA association across industry categories, geographic regions, firm size groups and board independence subgroups using forest plot visualisations. Meaningful coefficient heterogeneity emerges across these subgroups. Regional differences suggest that local innovation systems and institutional environments shape how effectively OLC translates into persistent performance. Larger sized firms and firms with different board independence levels also display divergent effect magnitudes. By comparison, inter industry differences do not reach consistent statistical decisiveness. It is important to highlight that these heterogeneity examinations are descriptive exploratory analyses instead of confirmatory hypothesis tests, without modifying the core hypotheses developed in Chapter 2.

Finally, Chapter 4 summarises the key empirical outputs in sequence. H1 receives support for the positive OLC-SCA direct association. The single mediator model validates partial transmission via technological innovation output; the multiple mediator SEM uncovers offsetting innovation stage pathways. Hypotheses 3a and 3b are supported, with stronger OLC effects for older firms and state owned firms. While diagnostic and instrumental variable tests broadly sustain the main conclusions, endogeneity risks cannot be fully eliminated by the available archival data. These empirical findings lay the empirical groundwork for Chapter 5's integrated discussion of theoretical implications, practical policy and managerial recommendations, study limitations and avenues for future research.

5. Discussion

Chapter 5 synthesises the full empirical evidence presented in Chapter 4, revisits the core theoretical arguments from Chapters 1-3, interprets key findings, derives policy and managerial implications, recognises multiple study limitations, and proposes concrete directions for future research. This concluding chapter integrates the theoretical framework and statistical results instead of merely repeating regression coefficients, and reflects on what can and cannot be inferred from the archival panel dataset of Chinese non-financial A share listed firms spanning 2010-2022.

First, the chapter provides an overall overview of the thesis. This doctoral work addresses the fundamental strategic puzzle: how organisations build and sustain competitive superiority amid rapid technological, institutional and market change within a developing economy context represented by China. Against the background that temporary profitability cannot guarantee lasting advantage, the thesis constructs an archival proxy for organisational learning capability (OLC) from two observable organisational foundations: the share of highly educated employees and the proportion of managers with technical backgrounds. It measures sustainable competitive advantage (SCA) using forward three year industry adjusted return on assets, capturing medium term performance persistence rather than permanent or environmental sustainability. Based on a balanced panel of 491 listed firms with 6 383 firm year observations, the thesis answers three research questions covering the direct effect of OLC, innovation related mediation mechanisms, and the moderating roles of firm age and state ownership.

The chapter then summarises key empirical findings systematically. First, OLC exhibits a statistically positive within firm association with SCA. When firms improve their combined human capital and technical managerial foundations, they tend to achieve stronger subsequent medium term industry relative profitability,

which supports Hypothesis 1. This result holds after including firm level controls as well as firm and year fixed effects. Second, innovation related conversion mechanisms are highly differentiated rather than uniform. The single mediator test confirms that technological innovation output proxied by patent applications carries a positive but partial indirect effect. The multiple mediator structural equation model further reveals offsetting pathways. Technological innovation output and highly educated human capital deliver positive specific indirect effects. By contrast, R&D intensity generates a negative specific indirect effect over the research time horizon, mainly because R&D expenditure brings upfront costs and uncertain delayed returns. The invention patent grant channel shows no statistically meaningful indirect path due to administrative examination lags. Owing to counter-balancing positive and negative paths, the aggregate indirect effect across all four mediators proves statistically insignificant, even though several individual mechanisms function distinctly. Third, the OLC-SCA relationship is conditional. The positive effect becomes stronger for older firms and for state owned enterprises, confirming Hypothesis 3a and Hypothesis 3b. Older firms benefit from accumulated organisational memory, routines and complementary assets that help them capitalise on enhanced learning resources. State owned firms gain from patient capital, policy access and institutional resources that allow learning driven investments to mature. Supplementary heterogeneity analysis detects variation across regions, firm size groups and board independence subgroups, while cross industry differences lack consistent statistical significance. Instrumental variable sensitivity tests retain a positive coefficient for OLC, yet the exclusion restriction for lagged OLC cannot be definitively validated, so causal inference remains cautious.

Building on these findings, the chapter elaborates policy implications for public authorities and practical suggestions for corporate managers. For policymakers, one core conclusion is that public support should focus on fostering organisational knowledge utilisation instead of simply subsidising innovation expenditure. R&D spending and patent numbers should not be treated as the sole evaluation criteria for enterprise policy. Human capital programmes will generate better persistent firm performance only when firms can connect skilled employees with technically informed strategic management decisions. Different innovation stages, including resource investment, technical output, formal patent recognition and commercial value realisation, operate differently; hence policy instruments ought to distinguish these phases. Uniform one size fits all policies may produce uneven outcomes across heterogeneous firms. Support schemes should take firm age, ownership type, regional innovation ecosystems and corporate governance conditions into consideration. Targeted measures for technical management training, industry university cooperation and knowledge commercialisation services can complement direct R&D subsidies. Policy assessment needs to track not merely innovation outputs but also subsequent medium term industry relative profitability.

For firm managers, the findings warn against treating educated staffing, technical executives, R&D investment and patent filings as interchangeable routes to lasting competitive advantage. Simply recruiting highly educated staff will not create value if there is insufficient technical managerial capacity to coordinate specialist expertise. Similarly, appointing technical managers yields limited pay-offs without a competent knowledgeable workforce. Managers should monitor the complete knowledge to value conversion chain: knowledge absorption, experimentation, codified innovation output and commercial appropriation. They need to recognise that heavy R&D investment may depress medium term performance before future benefits materialise. Instead of chasing patent quantity targets, organisations should emphasise whether knowledge resources translate into adaptive responses and sustained relative profitability. For older firms, managers should make full use of accumulated organisational experience while guarding against organisational inertia. For state owned firm management, it is vital to turn institutional resource advantages into genuine knowledge conversion rather than symbolic innovation activities.

Subsequently, the thesis explicitly lays out its major limitations. First, the research relies entirely on secondary archival CSMAR data. The OLC composite index only captures human resource and managerial observable foundations. It cannot directly measure critical behavioural and cultural dimensions of organisational learning capability such as knowledge sharing culture, psychological safety, internal experimentation routines and managerial commitment to learning. Second, the sample is restricted to non-financial Chinese A share listed surviving firms within the balanced panel. Privately owned firms, newly listed businesses and delisted enterprises are excluded, which constrains external generalisability. Third, SCA is operationalised as medium term forward profitability. This accounting based proxy cannot fully capture theoretical SCA constructs such as barriers to imitation, customer value or long run permanent competitive insulation, and it is subject to accounting reporting biases. Fourth, although firm year fixed effects and instrumental variable sensitivity tests are adopted, the study cannot completely eliminate all endogeneity risks arising from reverse causality and time varying unobserved firm level confounding factors. Even with robustness checks, definitive causal claims cannot be established purely from this archival panel dataset.

Correspondingly, the chapter puts forward actionable recommendations for future research. First, scholars may combine longitudinal survey instruments with administrative archival records. Surveys can

measure learning culture, internal knowledge sharing behaviours and organisational routines that secondary data cannot observe, while archival data supply long run financial and innovation outcomes. Integrating both sources would offer more comprehensive validation for the OLC construct. Second, future work could adopt more sophisticated measurements for innovation quality and commercialisation performance instead of counting patent quantity alone. Indicators including patent citations, new product sales and technology licensing income can better reflect real commercial value created by innovation. Third, research could expand sample coverage to private unlisted firms and newly listed enterprises to test whether the OLC-SCA relationships hold for organisations outside the balanced surviving listed firm sample. Fourth, identification strategies can be improved by exploiting exogenous external policy shocks and institutional changes to achieve cleaner causal identification, which helps separate the effect of OLC from other confounding firm characteristics. Further studies can also explore at which exact conditions learning related resources evolve into real collective organisational capability and under what circumstances such capability produces competitive advantage resistant to competitors' counter responses. These extensions will deepen understanding of how knowledge based capability shapes firm competitiveness in emerging economy contexts.

Finally, the chapter concludes the whole dissertation. This study contributes by building an archival measured OLC index, disentangling multi-stage innovation mediation pathways and verifying contingent effects of firm age and state ownership among Chinese listed firms. It highlights that sustainable competitive advantage originates not merely from possessing knowledge related resources, but crucially from organisations' capacity to convert those resources into continuously renewed superior performance. Nevertheless, given inherent measurement and sample limitations, more multi-source empirical work is required to corroborate and extend the present conclusions.

Reference

- [1]. Abdeen, H., De-Pablos-Heredero, C., Cosculluela-Martínez, C., & Montes-Botella, J.-L. (2026). Strategic leadership and its impact on dynamic capabilities and sustainable competitive advantages. *Management Decision*, 64(5), 1845–1868. <https://doi.org/10.1108/md-07-2024-1682>
- [2]. Abdelbaky, A., Liu, T., Mingyang, X., Shahzad, M. F., & Hassanein, A. (2025). Real earnings management and ESG performance in China: The mediating role of corporate innovations. *International Journal of Finance & Economics*, 30(4), 3476–3499. <https://doi.org/10.1002/ijfe.3074>
- [3]. Baaij, M., Greeven, M., & Van Dalen, J. (2004). Persistent superior economic performance, sustainable competitive advantage, and schumpeterian innovation: *European Management Journal*, 22(5), 517–531. <https://doi.org/10.1016/j.emj.2004.09.010>
- [4]. Bagozzi, R. P., & Yi, Y. (1988). On the evaluation of structural equation models. *Journal of the Academy of Marketing Science*, 16(1), 74–94. <https://doi.org/10.1007/BF02723327>
- [5]. Cadden, T., Weerawardena, J., Cao, G., Duan, Y., & McIvor, R. (2023). Examining the role of big data and marketing analytics in SMEs innovation and competitive advantage: A knowledge integration perspective. *Journal of Business Research*, 168, 114225. <https://doi.org/10.1016/j.jbusres.2023.114225>
- [6]. Cai, H., Wang, J., & Jin, X. (2026). The relationship between learning organization system on innovation performance: Testing moderated mediation role of organizational cultural identification. *Frontiers in Psychology*, 17, 1828291. <https://doi.org/10.3389/fpsyg.2026.1828291>
- [7]. Del Rio, P., Garcia-Quevedo, J., & Martinez-Ros, E. (2025). Corporate environmental R&D: Does organisational innovation matter? *Industry and Innovation*, 32(6), 710–745. <https://doi.org/10.1080/13662716.2024.2420792>
- [8]. Ding, M., Yu, W., Zeng, T., & Wang, S. (2024). PTNS: Patent citation trajectory prediction based on temporal network snapshots. *Scientific Reports*, 14(1), 24034. <https://doi.org/10.1038/s41598-024-75913-0>
- [9]. Fan, Q., Cheng, S., Chun, D., & Zhang, Y. (2025). To exploit or explore? Research on the relationship between performance gap and ambidexterity innovation. *Technology Analysis & Strategic Management*, 37(11), 1481–1494. <https://doi.org/10.1080/09537325.2024.2319596>
- [10]. Fang, H. “Chevy,” Kotlar, J., & Chrisman, J. J. (2025). Family control and sustainable competitive advantage. *Family Business Review*, 38(2), 84–120. <https://doi.org/10.1177/08944865251321881>
- [11]. Gamón-Sanz, A., Chiva, R., & Alegre, J. (2024). Lean startup and organizational learning capability: A case study in a research and technology organization. *Engineering Management Journal*, 36(5), 537–547. <https://doi.org/10.1080/10429247.2024.2339136>
- [12]. Gan, J. (2025). The effect of patent incentive policy synergy on patent quality—Mediating role of firms' ambidextrous R&D behavior. *IEEE Transactions on Engineering Management*, 72, 1207–1230. <https://doi.org/10.1109/tem.2025.3554311>

- [13]. Hagedoorn, J., & Cloudt, M. (2003). Measuring innovative performance: Is there an advantage in using multiple indicators? *Research Policy*, 32(8), 1365–1379. [https://doi.org/10.1016/S0048-7333\(02\)00137-3](https://doi.org/10.1016/S0048-7333(02)00137-3)
- [14]. Halbusi, H. A., Soto-Acosta, P., Popa, S., & Hassani, A. (2024). The role of green digital learning orientation and big data analytics in the green innovation–sustainable performance relationship. *IEEE Transactions on Engineering Management*, 71, 12886–12896. <https://doi.org/10.1109/tem.2023.3277078>
- [15]. Iaia, L., Nespoli, C., Vicentini, F., Pironti, M., & Genovino, C. (2024). Supporting the implementation of AI in business communication: The role of knowledge management. *Journal of Knowledge Management*, 28(1), 85–95. <https://doi.org/10.1108/jkm-12-2022-0944>
- [16]. Idrees, H., Xu, J., Andrianarivo Andriandafiarisoa Ralison, N. A., & Kadyrova, M. (2023). Does leadership and management support facilitate green knowledge acquisition and green innovation: A moderated mediation approach. *Business Process Management Journal*, 29(4), 1249–1276. <https://doi.org/10.1108/bpmj-12-2022-0639>
- [17]. Jaffe, A. B., & De Rassenfosse, G. (2017). Patent citation data in social science research: Overview and best practices. *Journal of the Association for Information Science and Technology*, 68(6), 1360–1374. <https://doi.org/10.1002/asi.23731>
- [18]. Jerez-Gómez, P., Céspedes-Lorente, J., & Valle-Cabrera, R. (2005). Organizational learning capability: A proposal of measurement. *Journal of Business Research*, 58(6), 715–725. <https://doi.org/10.1016/j.jbusres.2003.11.002>
- [19]. Kaganer, E., IESE Business School, University of Navarra, Gregory, R. W., Miami Herbert Business School, University of Miami, Sarker, S., & McIntire School of Commerce, University of Virginia. (2023). A process for managing digital transformation: An organizational inertia perspective. *Journal of the Association for Information Systems*, 24(4), 1005–1030. <https://doi.org/10.17705/1jais.00819>
- [20]. Khan, A. N., Mehmood, K., & Kwan, H. K. (2024). Green knowledge management: A key driver of green technology innovation and sustainable performance in the construction organizations. *Journal of Innovation & Knowledge*, 9(1), 100455. <https://doi.org/10.1016/j.jik.2023.100455>
- [21]. Lai, Z., Lian, Y., Zhao, F., & Zheng, Y. (2025). Green at the top: How CEOs' environmental experience shapes ESG performance in Chinese firms. *International Review of Economics & Finance*, 103, 104451. <https://doi.org/10.1016/j.iref.2025.104451>
- [22]. Latif, K. F. (2025). Sustainable leadership and knowledge ingredients—The recipe for sustainable competitive advantage: A mixed-method approach. *Knowledge Management Research & Practice*, 23(5), 479–492. <https://doi.org/10.1080/14778238.2024.2393583>
- [23]. MacKinnon, D. P., Lockwood, C. M., Hoffman, J. M., West, S. G., & Sheets, V. (2002). A Comparison of Methods to Test Mediation and Other Intervening Variable Effects. *Psychological Methods*, 7(1), 83–104. <https://doi.org/10.1037/1082-989X.7.1.83>
- [24]. Mady, K., Anwar, I., & Abdelkareem, R. S. (2024). Nexus between regulatory pressure, eco-friendly product demand and sustainable competitive advantage of manufacturing small and medium-sized enterprises: The mediating role of eco-innovation. *Environment, Development and Sustainability*, 28(2), 3399–3421. <https://doi.org/10.1007/s10668-024-05096-1>
- [25]. Nonaka, I. (1994). A dynamic theory of organizational knowledge creation. *Organization Science*, 5(1), 14–37. <https://doi.org/10.1287/orsc.5.1.14>
- [26]. Olsson, A. K., Eriksson, K. M., & Carlsson, L. (2025). Management toward industry 5.0: A co-workshop approach on digital transformation for future innovative manufacturing. *European Journal of Innovation Management*, 28(1), 65–84. <https://doi.org/10.1108/ejim-09-2023-0833>
- [27]. Pak, J., Heidarian Ghaleh, H., & Mehralian, G. (2023). How does human resource management balance exploration and exploitation? The differential effects of intellectual capital-enhancing HR practices on ambidexterity and firm innovation. *Human Resource Management*, 62(6), 933–952. <https://doi.org/10.1002/hrm.22180>
- [28]. Parker, A., Waldstrøm, C., & Tasselli, S. (2025). The effect of perceptions of exploration and exploitation work activities on dynamic organizational knowledge networks. *Social Networks*, 82, 201–212. <https://doi.org/10.1016/j.socnet.2025.04.004>
- [29]. Qiao, G., Li, Y., & Hong, A. (2024). The strategic role of digital transformation: Leveraging digital leadership to enhance employee performance and organizational commitment in the digital era. *Systems*, 12(11), 457. <https://doi.org/10.3390/systems12110457>
- [30]. Qin, J., Lin, J., & Subramanian, A. M. (2024). Balancing Exploitative and Exploratory Innovation in High-Tech Small- and Medium-Sized Enterprises: The Role of Digitalization and Performance Feedback. *IEEE Transactions on Engineering Management*, 71, 11652–11668. <https://doi.org/10.1109/tem.2024.3416814>

- [31]. Ramadhan, A., Iyiola, K., & Alzubi, A. B. (2024). Linking absorptive capacity to project success via mediating role of customer knowledge management capability: The role of environmental complexity. *Business Process Management Journal*, 30(3), 939–962. <https://doi.org/10.1108/bpmj-07-2023-0511>
- [32]. Rashid, A., & Rasheed, R. (2026). The role of human resource capabilities and information sharing in innovative supply chains: Mediating role of organizational learning capabilities. *Sustainable Development*, sd.70788. <https://doi.org/10.1002/sd.70788>
- [33]. Sadeghi, V. J., Garcia Perez, A., Vrontis, D., & Bedford, D. (2024). Viewpoint: Digital resilience, new business models and international entrepreneurship in the era of knowledge-economy. *Journal of Enterprise Information Management*, 37(5), 1401–1417. <https://doi.org/10.1108/jeim-09-2024-636>
- [34]. Saeedikiya, M., Salunke, S., & Kowalkiewicz, M. (2025). The nexus of digital transformation and innovation: A multilevel framework and research agenda. *Journal of Innovation & Knowledge*, 10(1), 100640. <https://doi.org/10.1016/j.jik.2024.100640>
- [35]. Tallarico, S., Pellegrini, L., Lazzarotti, V., & Lazzini, S. (2025). Boosting firms' absorptive capacity: The digital technologies edge. *European Journal of Innovation Management*, 28(6), 2558–2580. <https://doi.org/10.1108/ejim-09-2023-0741>
- [36]. Teece, D. J., Pisano, G., & Shuen, A. (1997). Dynamic capabilities and strategic management. *Strategic Management Journal*, 18(7), 509–533. [https://doi.org/10.1002/\(SICI\)1097-0266\(199708\)18:7%3C509::AID-SMJ882%3E3.0.CO;2-Z](https://doi.org/10.1002/(SICI)1097-0266(199708)18:7%3C509::AID-SMJ882%3E3.0.CO;2-Z)
- [37]. Ul-Durar, S., Awan, U., Varma, A., Memon, S., & Mention, A.-L. (2023). Integrating knowledge management and orientation dynamics for organization transition from eco-innovation to circular economy. *Journal of Knowledge Management*, 27(8), 2217–2248. <https://doi.org/10.1108/jkm-05-2022-0424>
- [38]. Van Hoang, D., Thi Hien, N., Van Thang, H., Nguyen Truc Phuong, P., & Thi-Thuy Duong, T. (2025). Digital capabilities and sustainable competitive advantages: The case of emerging market manufacturing SMEs. *Sage Open*, 15(2), 21582440251329967. <https://doi.org/10.1177/21582440251329967>
- [39]. Wang, C., Zhang, M., & Ma, H. (2024). The more ambidexterity the better? The moderating effect of organizational learning between high-performance HR practices and organizational performance. *Frontiers in Psychology*, 14, 1283637. <https://doi.org/10.3389/fpsyg.2023.1283637>
- [40]. Wang, J., Osei, A., & Agyemang, A. O. (2025). Leveraging green innovation and eco-technology for sustainable competitive advantage: Firm-level productivity analysis in China and the united states. *Business Strategy and the Environment*, 34(6), 7389–7411. <https://doi.org/10.1002/bse.4360>
- [41]. Wang, L., & Yang, H. (2024). Digital technology innovation and corporate ESG performance: Evidence from China. *Economic Change and Restructuring*, 57(6), 207. <https://doi.org/10.1007/s10644-024-09791-x>
- [42]. Xie, J., Tian, J., Hu, Y., Wang, Q., & Dai, Z. (2025). Imported intermediate goods, intellectual property protection, and innovation in Chinese manufacturing firms. *Economic Modelling*, 144, 106960. <https://doi.org/10.1016/j.econmod.2024.106960>
- [43]. Xu, H., & Deng, S. (2024). Digital mergers and acquisitions and enterprise innovation quality: Analysis based on research and development investment and overseas subsidiaries. *Sustainability*, 16(3), 1120. <https://doi.org/10.3390/su16031120>
- [44]. Yang, T., Cui, Y., & Li, R. (2023). Exploitation or exploration? Managerial myopia, economic policy uncertainty and ambidextrous innovation investment. *Sustainability*, 15(9), 7173. <https://doi.org/10.3390/su15097173>
- [45]. Yang, Y., Wang, Y., & Feng, F. (2023). Top management team background, university-industry collaboration, and innovation performance: A causal mediation analysis in Chinese listed firms. *Technology Analysis & Strategic Management*, 35(4), 464–477. <https://doi.org/10.1080/09537325.2021.1979203>
- [46]. Zada, M., Khan, S., Zada, S., & Dhar, B. K. (2025). Driving sustainable development through CSR leadership: Insights into organizational learning and technological innovation. *Sustainable Development*, 33(3), 4060–4074. <https://doi.org/10.1002/sd.3341>
- [47]. Zhang, H., Sun, X., Ahmad, M., & Wang, X. (2024). Heterogeneous impacts of carbon emission trading on green innovation: Firm-level in China. *Energy & Environment*, 35(7), 3504–3529. <https://doi.org/10.1177/0958305x231164690>