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Escaping the Financialization Trap: Technological Blockades and Enterprise Financial Asset Allocation

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Abstract

Amid intensifying global technological competition, external technological blockades have emerged as a critical source of uncertainty that reshapes corporate financial strategies. This study examines whether and how such blockades influence the reconfiguration of financial asset allocation through knowledge-driven strategic adaptation. Using panel data on listed enterprises from 2012 to 2022, we find that technological blockades are associated with dual effects on corporate financialization: a marked decline in the scale of financial assets—reflected in lower financial asset ratios and returns, and a structural shift toward greater portfolio diversification. Theoretically, this study proposes an integrative framework identifying four transmission channels through which blockades may reshape financial behavior: credit leverage contraction, supply chain funding crowding-out, business barrier intensification, and competitiveness weakening. Methodologically, it introduces an analytical framework for assessing scale-structure dual effects in financialization dynamics under exogenous shocks. Notably, the evidence reveals pronounced contextual heterogeneity: both scale and structural effects are concentrated among enterprises with limited core technology reserves, lower TFP, lower market share, lower R&D intensity, and lower patent quality. Furthermore, supply chain concentration, digital transformation, and Industry-University-Research collaboration are found to amplify these effects. These findings offer novel insights into how knowledge constraints may trigger strategic asset reallocation in emerging markets, contributing to innovation systems literature by elucidating financialization adjustment mechanisms under technological pressure. The research offers suggestive, evidence-based guidance for enterprises navigating innovation constraints while maintaining financial resilience.

Keywords: *technological blockades*, *financial asset allocation*, *supply chain structure*, *financialization*, *strategic responses*

JEL Classification: D22, E44, L22, O33

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1 INTRODUCTION

In the course of modern economic development, the increasingly intensified "structural imbalance" between the real economy and the financial sector has emerged as a critical issue. This phenomenon is characterized by the substantial diversion of capital from productive activities to financial investment, leading to a decline in industrial innovation momentum and core competitiveness, and significantly exacerbating the vulnerability of the real economy. Taking China as an example, according to official statistics from the NBSC (Fig. 1), the total scale of China's financial assets surged from RMB 156.8 trillion in 2012 to RMB 486.3 trillion in 2022, with an average annual growth rate of 12%, reflecting the deepening financialization of the economy. Similarly, between 2012 and 2020, the share of the financial sector in GDP increased from 12.1% to 15.7%, representing an average annual growth rate of 11.2%, which exceeds the GDP growth rate by 4.8 percentage points. In contrast, the share of the manufacturing sector in GDP declined from 31.4% to 26.2%, underscoring the persistent structural imbalance. Despite China's rapid economic growth, financial liberalization policies and an accommodative monetary environment have institutionally facilitated the reallocation of capital, gradually revealing the return advantage of financial activities over real-sector operations. However, excessive financialization has led to a massive concentration of resources within the financial sector, severely distorting resource allocation and fostering conditions for liquidity surplus and asset price bubbles (Krippner, 2005). This phenomenon may trigger systemic financial risks through the hollowing out of the real economy, thereby posing a serious threat to long-term economic stability.

At the micro level, the trend of excessive financialization in China is primarily reflected in firms' financial asset allocation preferences, meaning that firms shift their strategic focus from core production operations to financial activities, particularly by investing in financial assets and engaging in capital market operations to generate returns (Demir, 2009). The financial-channel profit model has gradually partially substituted the production-channel profit model. Data show that the average proportion of financial asset holdings among firms rose rapidly from 32.7% in 2012 to 45.6% in 2020. However, this rapid growth has also laid the groundwork for significant latent risks. While excessive financialization brings considerable returns to firms, it may also induce short-term profit pursuits, leading to the neglect of innovation and productive investment in core businesses, thereby severely constraining their endogenous growth capacity. Moreover, excessive allocation to financial assets renders firms more vulnerable to capital markets, particularly during economic downturns or periods of market turbulence, when financial assets may suffer sharp devaluations, resulting in substantial financial losses and further weakening firms' risk resilience and long-term stability. Numerous studies have also confirmed that Chinese firms' financial asset

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allocation behavior exhibits a marked trend of shifting from the real to the virtual economy, rather than achieving the ideal state of coordinated development between the real and virtual economies (Zhang & Zhang, 2016).

Notably, the year 2020 marked a critical turning point in firms' financial asset allocation preferences. As shown in Fig. 1, starting from 2020, the financial asset ratios held by Chinese micro-level firms shifted from an upward to a downward trend, decreasing from 45.6% in 2020 to 42.4% in 2022, which represents a significant divergence from the macro-level trend. This structural shift has taken place amid a confluence of external shocks. On the one hand, the rise of trade protectionism, intensifying deglobalization trends, and the widespread implementation of decoupling and supply chain disruption strategies have significantly weakened the dynamism and expansion potential of China's financial markets. On the other hand, the sudden outbreak of COVID-19 disrupted firms' liquidity expectations and cash management practices, further intensifying their cautious stance toward financial asset allocation. In this context, the space for financial arbitrage among real-sector firms has been substantially compressed, and the return differential between financial assets and industrial capital has narrowed considerably, and in some sectors has even reversed. For example, among firms listed on the STAR Market, the capitalization rate of R&D expenditures increased by 11.4% from 2020 to 2022, while the median return on financial assets fell by 16.6 percentage points. Furthermore, developed countries have established a comprehensive technological blockade system through institutional measures such as entity lists and long-arm jurisdiction, restricting Chinese firms' access to core technologies and innovation resources. Against this backdrop, firms' asset allocation priorities underwent a marked shift: instead of pursuing short-term financial arbitrage, they increasingly redirected assets toward productive investments and innovation-driven R&D. Taking Huawei as an example, the company allocated most of the liquidity obtained from monetizing financial assets to breakthrough technological R&D. Specifically, Huawei significantly reduced its financial asset holdings from 15.6% in 2020 to 6.3% in 2022, with approximately 22.7% of the capital invested in specialized R&D at HiSilicon. This technology-substitution investment strategy enhanced the marginal return on real assets, increasing them by 5.9 percentage points, further strengthening the firm's asset resilience. Overall, from 2020 to 2022, the annual growth rate of R&D expenditures among Chinese micro-level firms reached 22.1%, far exceeding the average growth rate of financial assets at 7.3%. Thus, this strategic transformation suggests that technological blockades may serve not only as a critical external shock capable of disrupting firms' path dependence on financialization, but also as a force with long-term and structural implications for the reconfiguration of corporate asset allocation structures. Building on this premise, this study focuses on how technological blockades, as exogenous and persistent shocks, reshape the logic and behavioral mechanisms underlying firms' financial asset allocation.

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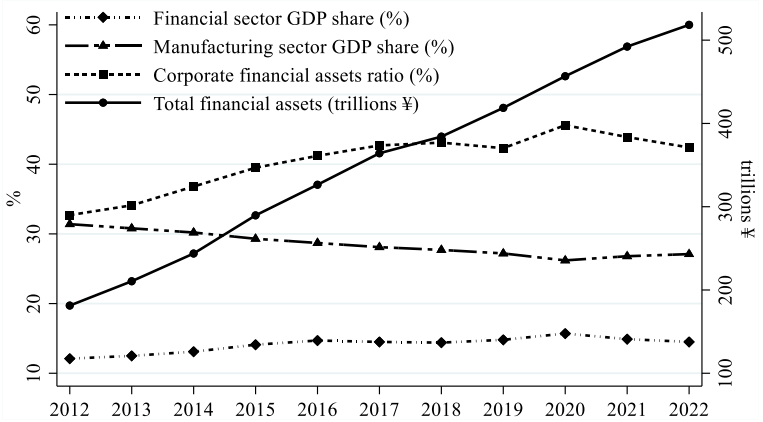


Fig. 1 – Trend of changes in relevant data. Source: own research

Technological blockades refer to actions taken by technological leaders to restrict strategic competitors from accessing key technologies and equipment, in order to maintain their technological and economic superiority (Zhang et al., 2022). Such suppression significantly increases firms' costs of technology acquisition and innovation risks, thereby compelling them to optimize their investment strategies. In this uncertain environment, firms tend to adopt more conservative risk preferences by reducing allocations to financial assets and increasing investments in productive assets with long-term value and independent R&D (Baker et al., 2016). This reflects a strategic rebalancing between financial and real-sector investments. Moreover, production networks serve as diffusion channels for the impacts of technological blockades, with disruptions propagating layer by layer through supply chains and gradually affecting a broader range of related firms (Acemoglu et al., 2012). When sanctioned firms experience production constraints or R&D stagnation, their upstream and downstream partners reassess expected returns and correspondingly adjust their asset structures to enhance overall risk resilience and strategic flexibility. Thus, technological blockades not only reshape resource allocation at the firm level but also trigger systemic reconfigurations through inter-firm linkages across industries.

Currently, the academic community has extensively discussed the factors affecting the financial asset allocation of real economy firms. Existing literature examines external factors from various perspectives, including climate risk (Ning et al., 2025), fixed asset risk (Demir, 2009), economic volatility (Arellano et al., 2019), financial regulatory policies (Iliopoulos & Wójcik, 2022), and minimum wage policies (Du et al., 2022). Specifically, external physical shocks increase the uncertainty and risk associated with fixed asset investment, thereby reducing the expected returns on fixed assets, and prompt firms to engage in financial asset allocation as a means of risk diversification (Ning et al., 2025). With the intensification of economic volatility, firms face tighter financing constraints, which typically lead to a reduction in productive investment, while simultaneously increasing the allocation of more liquid financial assets as a precautionary buffer (Arellano et al., 2019). Particularly when the expected returns on financial assets significantly exceed those of traditional industrial investments, firms

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tend to allocate more to financial assets in pursuit of excess returns, even at the expense of crowding out real investment (Demir, 2009). Additionally, more accommodative financial regulatory policies and increases in minimum wage standards further motivate firms to seek higher returns in the financial markets, thereby reinforcing the trend of financialization (Iliopoulos & Wójcik, 2022; Du et al., 2022). Overall, the existing literature has validated several factors that drive firms' financial asset allocation. However, this body of research remains largely confined to traditional macroeconomic and institutional determinants. Against the backdrop of intensifying geopolitical competition, external risks have escalated significantly, and blindly allocating financial assets no longer aligns with current economic development trends, thus necessitating the exploration of effective paths to curb excessive financialization. Meanwhile, profound changes in the global technological environment and technological landscape have made technological competition a decisive factor in firms' resource allocation, yet its potential impact on financial asset allocation remains unclear, thereby highlighting an important gap for further investigation.

Drawing on the theories of resource dependence and dynamic capabilities, this study utilizes firm-level data from China to examine how technological blockades influence corporate financial asset allocation, as well as the mechanisms driving this relationship. In contrast to prior research, the potential marginal contributions of this paper lie in the following aspects:

(1) Unlike existing studies that focus on the external characteristics of firms (Ning et al., 2025; Iliopoulos & Wójcik, 2022; Du et al., 2022; Arellano et al., 2019; Demir, 2009), this paper extends the research perspective on firms' financial asset allocation behavior to the exogenous shock of "technological competition". It systematically explores how foreign technological blockades reshape firms' financial asset allocation decisions and restrain profit-seeking behavior through channels such as credit leverage weakening, supply chain capital squeeze, business barrier deepening, and competitiveness weakening. This stands in contrast to the traditional view that external physical shocks and other exogenous factors intensify the inclination toward financial asset allocation. By examining the scale and structural effects, this paper reveals the strategic responses of different firms' financial asset allocation behaviors when facing external technological blockades, thereby expanding the theoretical scope of financial asset allocation research. It not only provides new empirical evidence on factors influencing firms' financial asset allocation but also presents a novel analytical framework for the decision-making behavior of emerging market firms amid decoupling and supply chain disruption.

(2) This paper incorporates supply chain structure into the research framework of technological blockade and firms' financial asset allocation, thereby broadening the scope of research on the economic consequences of technological blockade. Existing studies highlight the important role of supply chains in firms' risk management. Supply chains are not only key support for building risk resilience (Acemoglu & Tahbaz-Salehi, 2025; Grossman et al., 2024; Alfaro-Ureña et al., 2022; Park et al., 2018), but also the

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main transmission channel for risk spillovers (Basco et al., 2024; Ersahin et al., 2024; Wang et al., 2023; Carvalho et al., 2021). However, existing studies have insufficiently examined the impact of supply chain concentration on firms' financial asset allocation in the context of technological blockade. Furthermore, this paper explores how supply chain concentration, digital transformation, and Industry-University-Research collaboration moderate the relationship between technological blockade and financial asset allocation. It provides a more comprehensive theoretical lens for understanding firms' strategic responses.

(3) This paper addresses the limitations of traditional indicators by constructing a technological blockade index based on firms' perceptions and designing instrumental variables that capture both industry-level external shocks and firms' heterogeneity, offering methodological innovation across macro and micro levels. Existing studies typically use indicators such as the number of licenses granted, whether a firm is included in an entity list, or events like the China-US trade war (Cao et al., 2024; Kong et al., 2024; Luo & Wu, 2022) to represent technological blockades. However, these proxy variables not only fail to comprehensively cover all companies affected by technological blockades but also cannot reflect the actual degree of impact on firms. This paper improves upon existing indicators by more precisely identifying and quantifying firms exposed to technological blockade shocks using textual information from annual reports. Furthermore, while previous research has often been limited to difference-in-differences analysis and lacks effective instrumental variable designs for technological blockades, this paper constructs instrumental variables combining industry-level sanction intensity and firms' technological deviation, thereby alleviating concerns of omitted variable bias and endogeneity. This contributes to the existing research paradigm and offers new analytical approaches and methodological references for future studies.

2 THEORETICAL FRAMEWORK AND HYPOTHESES

2.1 Technological blockade and financial asset allocation

According to RBV theory, corporate competitiveness derives from enterprises' capacity to integrate and utilize rare, unique, and irreplaceable resources and core competencies, enabling them to create and sustain relative advantages over time (Barney, 1991; Porter, 1985). Within this framework, factors like technological capability and market position are interdependent and mutually reinforcing elements. Firms' decisions are adaptive responses to constraints imposed by external dependence on critical resources (Pfeffer & Salancik, 1978). When a technological blockade disrupts firms' access to external technological resources, this exogenous shock reshapes the boundaries of resource dependence and heightens external uncertainty (Sears, 2018). Firms initially respond by reallocating resources in an adaptive manner. Yet, such adaptation alone is insufficient to restore competitiveness. Accordingly, dynamic capabilities theory highlights a shift from passive adaptation to proactive capability renewal (Teece et al., 1997). By reconfiguring internal resources and operational processes, firms rebuild

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competitive foundations and regain technological and market advantages (Zahra et al., 2006; Zott, 2003). This integrative perspective reconciles short-term constraint response with long-term capability development, framing competitiveness restoration as a dynamic, staged process evolving from resource dependence toward capability renewal. Consequently, firms are inclined to scale up research spending and advance indigenous innovation (Kulatilaka & Perotti, 1998), thereby enhancing industrial attractiveness and competitiveness(Dai et al., 2025), stimulating the potential of real investments, and ultimately facilitating the transition from "financialization" to "real economy".

Exogenous technological blockades severely undermine firms' competitiveness, leading to declining market confidence and triggering sharp adjustments in capital market valuations, which significantly erode returns from financial investments such as equities. In this context, firms typically reduce existing financial asset holdings and cut back on reinvestments in financial assets to avoid losses from stock market crashes (Almeida & Campello, 2007). Meanwhile, firms gradually decrease reliance on traditional financing methods like equity and debt financing, reallocating more financial resources back to the real economy and shifting toward non-financial development pathways such as technological cooperation and strategic alliances (Hagedoorn, 2002). This enables a dynamic alignment between internal resource allocation and external environmental constraints (Tukamuhabwa et al., 2015), effectively mitigating the negative impacts of technological blockades. Furthermore, through internal resource integration and reallocation, firms may convert precautionary financial assets into seed funding for technological breakthroughs (Pfeffer & Salancik, 1978), which not only reduces the proportion of financial assets but also leads to declining returns on financial investments. Under such circumstances, technological blockade manifests as a scale effect on financial asset allocation.

Technological blockades may also compel firms to increase diversification in their financial asset allocation. For one thing, rising technology acquisition costs and constrained external resources heighten firms' liquidity needs. To sustain operations and make critical investments, firms may rapidly liquidate a substantial portion of financial assets to boost cash reserves (Opler et al., 1999), thereby avoiding excessive concentration of financial assets. For another, amid intense environmental uncertainty, firms tend to allocate more resources to low-volatility assets and favor financial instruments closely aligned with their core businesses, such as supply chain finance and industrial investment funds. Such a strategy not only elevates the stability of portfolio returns but also facilitates industry-finance integration to strengthen competitive advantages (Allen & Gale, 2000). In this context, technological blockade produces a structural reconfiguration effect on financial asset allocation. Notably, the scale and structural effects are not independent phenomena but two interrelated dimensions of the same adjustment process—the former reflecting the contraction in the share and returns of financial assets, the latter capturing the diversification of allocation structure. Together, they characterize the adaptive adjustment mechanism of corporate financial

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asset allocation under technological blockade. Accordingly, we propose:

H1: Technological blockades affect firms' financial asset allocation through scale and structural effects. The scale effect manifests as reduced asset ratios and declining returns, while the structural effect is reflected in increased diversification of financial assets.

2.2 Mechanism analysis

2.2.1 Weakening of credit leverage

Technological blockades impair a firm's capacity for financial asset allocation by deteriorating its credit rating. The downgrade in credit rating undermines financial institutions' confidence in the firm's growth prospects and debt repayment ability, thereby constraining its access to traditional financing channels (Campello et al., 2010). This compels the firm to rely more heavily on internal funds to bridge the financing gap, consequently reducing both the proportion and returns of financial assets. Concurrently, technological blockades weaken a firm's market competitiveness, reducing the liquidity and market value of inventory, accounts receivable, and real estate assets, which further exacerbates financial pressures (Duchin et al., 2010). Moreover, technological assets such as patents may depreciate due to innovation stagnation, diminishing their collateral value (Duchin et al., 2010). This not only reduces the firm's financial leverage capacity but also increases financing costs(Pineda Perez & Grijalvo, 2025), forcing it to concentrate more resources on core operations and consequently further shrinking the proportion of financial assets. Facing tightened credit and reduced available funds, firms are compelled to diversify their limited financial resources across more liquid and less risky instruments, thereby increasing the diversification of financial assets. Accordingly, we propose:

H2: Technological blockades deteriorate firms' credit rating and raise external financing costs, ultimately reversing their financial asset allocation trajectory.

2.2.2 Crowding-out of supply chain funds

Technological blockades constrain firms' financial allocation capacity by destabilizing supply chain financing mechanisms. As a firm's technological capability and production capacity deteriorate, upstream suppliers may grow concerned about its creditworthiness, consequently reducing credit lines, demanding more cash payments, or shortening payment terms (Carvalho et al., 2021). This compels the firm to allocate more capital to accounts payable, directly reducing the funds available for financial asset investment, thereby lowering both the proportion and returns of financial assets. Concurrently, technological blockades diminish a firm's technological sophistication and production efficiency, impairing its ability to meet downstream customers' demand for high-tech, quality products, and thereby weakening customer relationships. Downstream buyers may shift to more competitive suppliers or reduce existing product demand, potentially adopting risk-mitigation strategies such as payment delays, order reductions, or

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requests for extended payment terms (Acemoglu et al., 2012), thereby exacerbating the firm's financial strain. To cope with the crowding-out of supply chain funds, firms typically concentrate more resources on ensuring cash flow and shift toward holding more liquid, low-risk assets rather than high-risk financial instruments, thereby increasing the diversification of financial asset holdings. Accordingly, we hypothesize:

H3: Technological blockades induce the crowding-out of supply chain funds, forcing firms to allocate more funds to safeguard cash flow and fulfill payment obligations, thereby reducing their capacity for capital market operations and ultimately reversing their financial asset allocation trajectory.

2.2.3 Deepening of business barriers

Technological blockades drive firms to build and strengthen business barriers, thereby suppressing their willingness to allocate financial assets. Under the pressure of technological blockades, firms become more reliant on domestic resources to achieve technological breakthroughs. By increasing investments in research and development, firms focus on technological innovation and deepening market penetration, aiming to overcome key technological bottlenecks with limited resources and ultimately create unique competitive advantages (Head & Ries, 2002; Rajan & Zingales, 1998; Levinthal, 1997). The construction and deepening of business barriers often require long-term and stable financial support, and this support generates continuous positive feedback for the firm(Romero-Castro & Miramontes-Viña, 2025). Consequently, enterprises cut down their participation in short-term capital market operations, leading to a decline in both the proportion and returns of financial assets. At the same time, by reallocating resources from financial holdings to long-term innovation investments and diversifying their asset portfolio across productive and financial instruments, firms increase the diversification of their overall asset allocation (Yeon, 2020). This strategic shift not only strengthens the firm's core competitiveness and autonomy but also avoids over-reliance on capital markets or non-core business activities, effectively reducing the flow of resources toward financialization. Accordingly, we hypothesize:

H4: Technological blockades drive firms to concentrate on their core business, reallocating resources to strengthen business barriers, thereby reducing their willingness to engage in capital market operations and ultimately reversing their financial asset allocation tendencies.

2.2.4 Competitiveness Weakening

Technological blockades influence firms' financial asset allocation decisions by weakening their market competitiveness. On the one hand, technological blockades restrict firms' access to key technologies and core components, leading to slower product iteration and deteriorating cost structures, which in turn undermine their pricing power and differentiation advantages in the market (Porter, 1985). The decline in competitiveness compresses firms' profit margins and cash flow stability, prompting

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them to adopt more conservative financial strategies, as reflected in reduced allocations to high-risk financial assets, which lowers both the proportion and returns of financial assets (Almeida et al., 2004). Meanwhile, technological blockades may also suppress firms' innovation output and technological accumulation, eroding their long-term growth potential (Aghion et al., 2005). When firms recognize their disadvantage in technological catch-up and market expansion, they are likely to reassess the risk-return profile of their asset portfolios, shifting toward a more diversified portfolio that includes various low-risk financial instruments across different categories, thereby increasing the diversification of financial asset holdings. Accordingly, we hypothesize:

H5: Technological blockades weaken firms' market competitiveness and innovation potential, urging firms to pursue more conservative financial asset allocation strategies, reduce their preference for high-risk financial assets, and thereby inhibit their overall tendency toward financialization.

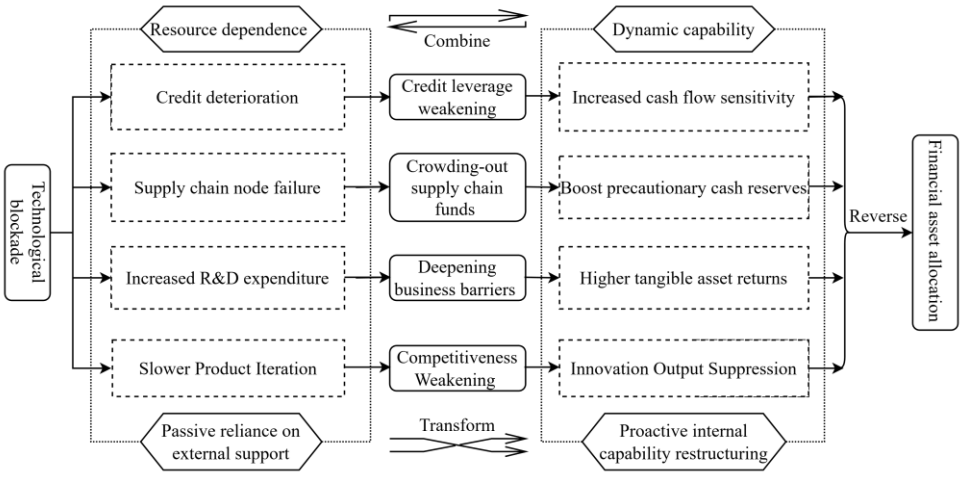


Fig. 2 – Mechanism flowchart. Source: own research

3 MODEL DESIGN AND INDICATOR SELECTION

3.1 Model design

Guided by the preceding analysis, this study develops a model to investigate how technological blockades affect firms' financial asset allocation:

$$Fin_{it} = \alpha + \beta_1 TB_{it} + \gamma Controls_{it} + Firm + Year + \varepsilon_{it} \quad (1)$$

In the model, Fin_{it} denotes the financial asset allocation of the firm i in year t, and TB_{it} captures the technological blockade index for the same firm and period. The parameter β_1 measures the influence of technological blockade on the financial asset allocation of the firm. Control variables at the firm level are denoted by $Controls_{it}$. Additionally, the model accounts for firm-specific fixed effects ($Firm$) and time-specific fixed effects ($Year$), with ε_{ith} denoting the error term.

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3.2 Variable definition

3.2.1 Dependent variable: firms' financial asset allocation

Existing literature commonly measures firms' financial asset allocation using proxies like whether firms hold financial assets, the scale of such assets, and financial asset ratios. This paper uses the following indicators: Fin1, defined as the ratio of financial assets (including trading and derivative financial assets, net loans, available-for-sale assets, held-to-maturity investments, and investment properties) to total assets; and Fin2, calculated as the ratio of financial returns (comprising investment income, fair value gains/losses, and other comprehensive income) to the absolute value of operating profits. Additionally, a financial asset diversification index (Fin3) is constructed to capture changes in the internal structure of financial assets. The formula used for the calculation is:

$$Fin3_{it} = \sum_{i=1}^{n} S_i^2 \tag{2}$$

where S_i represents the proportion of various financial assets in the total assets. A lower Fin3 value indicates greater financial asset diversification.

3.2.2 Independent variable: technological blockade

Existing studies primarily measure technological blockade and related sanction measures through indicators such as the number of approved licenses, inclusion in the Entity List, and events related to the China-U.S. trade conflict (Cao et al., 2024; Kong et al., 2024; Luo & Wu, 2022). However, given the multidimensional and complex nature of technological blockade impacts, these proxy variables exhibit significant limitations in reflecting sanction effects: on the one hand, such indicators fail to comprehensively cover all firms affected by technological blockades; on the other hand, they cannot accurately assess the extent of the impact experienced by individual firms. Against this backdrop, this study adopts an innovative firm perception perspective and utilizes a textual analysis approach to deeply mine corporate annual reports, aiming to evaluate the impact of technological blockades more objectively and comprehensively. Specifically, we construct a technological blockade-related keyword dictionary and systematically analyze the frequency and context of related expressions in annual report texts, thereby more precisely identifying affected firms and quantifying the degree of impact. Compared with traditional research that relies on a single macro perspective and list-based indicators, the method employed in this study offers several advantages: first, it directly captures firms' active perceptions and responses toward technological blockades; second, it more fully captures the multidimensional impact of technological blockades on firms' operations; and third, through textual analysis, it enables a more precise characterization of the degree to which firms are affected.

Regarding the specific steps for measuring the technological blockade (TB), this research follows the steps below. First, it gathers annual reports of China's A-share

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listed firms spanning 2012 to 2022 through Python crawler techniques. These raw textual reports were then parsed into structured text files using natural language processing algorithms. Next, drawing on commonly used expressions of technological blockade in the existing literature and leveraging the deep learning capabilities of the WinGo Financial Text Data Platform, a keyword dictionary was constructed. This dictionary includes semantically explicit terms such as "technological restrictions", "control over critical equipment", and "technology export controls" (see Tab. 1 for the full keyword dictionary). Subsequently, based on the keyword dictionary, syntactic structure analysis was conducted to examine the subject-verb-object relationships of keywords in context, with a particular focus on identifying the semantic role of the "blocked party". This step ensures that the semantics of technological blockade indeed target the affected firms. Finally, the frequency of keywords related to the "blocked party" in each annual report was counted, and their proportion in the total word count of the main text was calculated. This proportion, multiplied by 100, forms the Technological Blockade Index, which quantifies the degree of technological blockades faced by the firm. Elevated index values signify a more significant impact of technological blockades on the firm.

In addition, drawing on yearly mean figures of this indicator, we examined its annual trend. As presented in Fig. 3, the index exhibited a steady upward trend before 2019, followed by a sharp increase from 2019 onwards. This pattern aligns with both observed realities and theoretical expectations, suggesting that the index effectively captures the evolving nature of technological blockade and confirms the validity of its construction methodology.

Tab. 1 – Keyword dictionary. Source: own research

Category	Keywords
Trade Confrontation & Friction	Trade Protectionism, Rising, Trade Friction, Friction, Protectionism
Specific Trade Barriers	Non-Tariff Barriers, Trade Barriers, Technology Export Controls, Anti-Dumping, Foreign Exchange Control
Sanctions & Legal Measures	Embargo, Technological Restrictions, Special Safeguard, International Sanctions, Economic Sanctions, Sanctions, Prohibition, Mandatory, Control Over Critical Equipment, Decree
Macro Context & Crises	Nuclear Crisis, Convention

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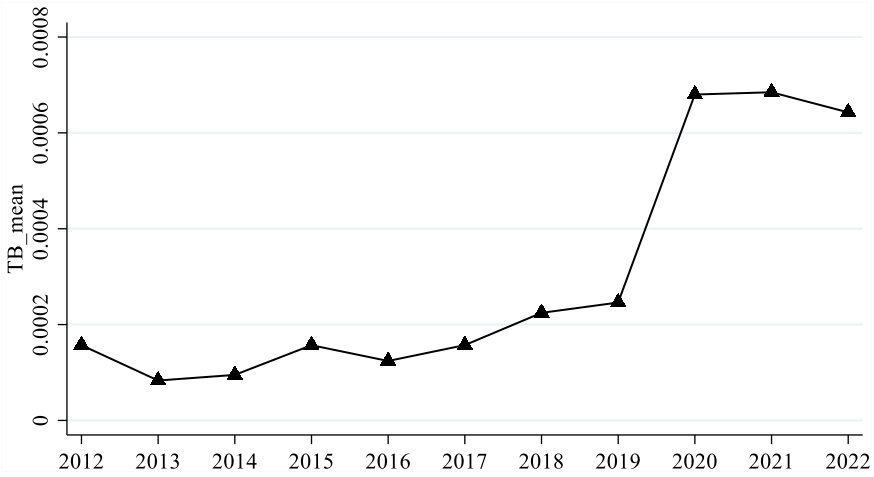


Fig. 3 – Annual trend of technological blockade index. Source: own research

3.2.3 Control variables

Based on prior research, this study includes the following control variables: firm size ($Size$), the natural logarithm of total assets; firm age (Age), the logarithm of (current year − year of establishment + 1); financial leverage (Lev), the ratio of total liabilities to total assets; revenue growth rate ($Growth$), the logarithmic growth rate of revenue (current-year revenue divided by previous-year revenue); cash flow ratio ($Cash$), the ratio of net cash flow to total assets; and fixed asset ratio ($Fixed$), the ratio of net fixed assets to total assets.

3.3 Data sources

The sample covers Chinese A-share listed firms(2012-2022), with firm-level data collected from the CSMAR database. To improve data quality, the following procedures are applied: first, financial sector firms are excluded; second, firms that were designated as ST or *ST or delisted in the sample period are removed; third, firms that conducted IPOs or exhibited abnormal financial conditions during the observation period are excluded; fourth, firms whose primary business underwent significant changes or whose key variables are missing during the observation period are eliminated. We winsorize continuous variables at the 1% tails to control for outliers and ensure data reliability. Tab. 2 shows the primary variable statistics. Tab. 3 reports the Pearson correlation coefficients for the main variables. The results show that the explanatory variable (TB) is significantly negatively correlated with the dependent variables (Fin1, Fin2, and Fin3), providing preliminary support for the subsequent regression analysis. Moreover, the control and core variables exhibit reasonable correlations, indicating that multicollinearity is not a serious concern.

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Tab. 2 – Variable statistics

Variables	Obs	Mean	Variance	Min	Max
$Fin1$	14387	0.022	0.043	0	0.429
$Fin2$	14387	0.134	0.383	0	2.002
$Fin3$	14387	0.002	0.011	0	0.635
TB	14387	0.001	0.001	0	0.019
$Size$	14387	21.827	1.028	19.865	26.139
Age	14387	2.797	0.353	1.609	3.497
Lev	14387	0.377	0.193	0.049	0.893
$Growth$	14387	0.185	0.359	-0.554	2.475
$Cash$	14387	0.046	0.064	-0.165	0.238
$Fixed$	14387	0.199	0.138	0.002	0.698

Tab. 3 – Pearson correlation coefficients

	$Fin1$	$Fin2$	$Fin3$	TB	$Size$	Age	Lev	$Growth$	$Cash$	$Fixed$
$Fin1$	1.00									
$Fin2$	-0.05***	1.00								
$Fin3$	0.64***	0.02***	1.00							
TB	-0.02**	-0.05***	-0.02*	1.00						
$Size$	0.09***	0.01	0.00	-0.01	1.00					
Age	0.16***	0.08***	0.06***	0.08***	0.21***	1.00				
Lev	-0.04***	0.19***	-0.07***	-0.02**	0.54***	0.21***	1.00			
$Growth$	-0.05***	-0.20***	-0.03***	-0.02*	0.04***	-0.08***	0.03***	1.00		
$Cash$	0.07***	-0.16***	0.04***	0.04***	0.05***	0.04***	-0.14***	0.01	1.00	
$Fixed$	-0.15***	0.09***	-0.09***	0.05***	0.08***	0.06***	0.13***	-0.08***	0.19***	1.00

4 EMPIRICAL EXAMINATION

4.1 Baseline estimation

We use Model (1) to test Hypothesis 1, examining how technological blockades affect firms' financial asset allocation. Tab. 4 presents the results. Under the control of both individual fixed effects and time fixed effects, Columns (1), (2), and (3) report the regressions excluding control variables, with the regression coefficients of TB being -1.168, -11.594, and -0.246, respectively, all significant at the 1% level. Columns (4), (5), and (6) report the regression results with control variables, with the regression coefficients of TB being -1.084, -11.742, and -0.235, all significant at the 1% level, supporting the view that a one-standard-deviation increase in technological blockade intensity is associated with a 1.084 standard deviation decrease in financial asset ratios, a 11.742 standard deviation decrease in financial asset returns, and a 0.235 standard deviation increase in financial asset diversification. These patterns suggest that technological blockades are associated with significant scale and structural effects on firms' financial asset allocation. Thus, the evidence supports Hypothesis 1.

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Tab. 4 – Baseline estimation

VARIABLE	(1)	(2)	(3)	(4)	(5)	(6)
	$Fin1$	$Fin2$	$Fin3$	$Fin1$	$Fin2$	$Fin3$
TB	-1.168***	-11.594***	-0.246***	-1.084***	-11.742***	-0.235***
	(-4.596)	(-4.524)	(-3.761)	(-4.301)	(-4.851)	(-3.674)
$Size$				-0.002	-0.062***	-0.000
				(-1.028)	(-4.700)	(-1.607)
Age				0.040***	0.081	0.006***
				(4.679)	(1.258)	(2.816)
Lev				-0.004	0.602***	-0.001
				(-0.885)	(12.911)	(-1.168)
$Growth$				-0.001	-0.177***	-0.000
				(-1.543)	(-17.231)	(-1.085)
$Cash$				-0.011*	-0.477***	-0.003**
				(-1.743)	(-6.646)	(-2.321)
$Fixed$				-0.017***	0.391***	-0.003***
				(-3.184)	(5.982)	(-3.111)
Firm FE	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES
Obs	14387	14387	14387	14387	14387	14387
Adj_R^2	0.454	0.219	0.408	0.457	0.276	0.409
F	21.13	20.47	14.15	7.657	83.02	3.585

Note: t-values in parentheses. ***p < 0.01, **p < 0.05, *p < 0.1. The same applies to all tables below, all of which include controls, firm FE, and year FE.

4.2 Robustness test

4.2.1 DID analysis based on U.S. entity list sanctions

The U.S. entity list is a key tool in the U.S. technological blockade against China. Whether a sample firm's industry is on the list may influence its risk assessment and business decisions. Based on this consideration, this study uses the U.S. entity list sanction event as an alternative tool for testing technological blockade. First, based on the U.S. Entity List, this study manually compiles yearly data on listed Chinese firms. Then, the industry of these companies is verified through the Qichacha website. Finally, it is determined whether any companies in the industry of the sample firms are on the entity list. Given the continuous expansion trend of the U.S. entity list, if a certain industry has companies under sanction in a given year, that industry is considered to be affected by the entity list sanctions in that year and subsequent years. It is important to note that Huawei, a leading private high-tech firm in China, was added to the entity list in May 2019. This event marked the transition of U.S. sanctions from targeting specific state-owned firms and military research institutions to a more systemic and industry-wide technological blockade, which also included private companies.

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Considering the time lag of sanction effects, this study uses 2020 as the policy point and applies a DID model to assess the impact of U.S. entity list sanctions on firms' financial asset allocation. The results in Tab. 5 show that these sanctions have significant scale and structural effects on firms' financial asset allocation and pass the parallel trends test (Fig. 4). These results further validate the foundational conclusions of this study.

Tab. 5 – DID analysis based on U.S. entity list sanctions. Source: own research

VARIABLE	(1)	(2)	(3)
	$Fin1$	$Fin2$	$Fin3$
DID	-0.015***	-0.085***	-0.003***
	(-6.249)	(-5.003)	(-6.089)
Obs	14387	14387	14387
Adj_R^2	0.459	0.276	0.410
F	10.80	83.34	6.645

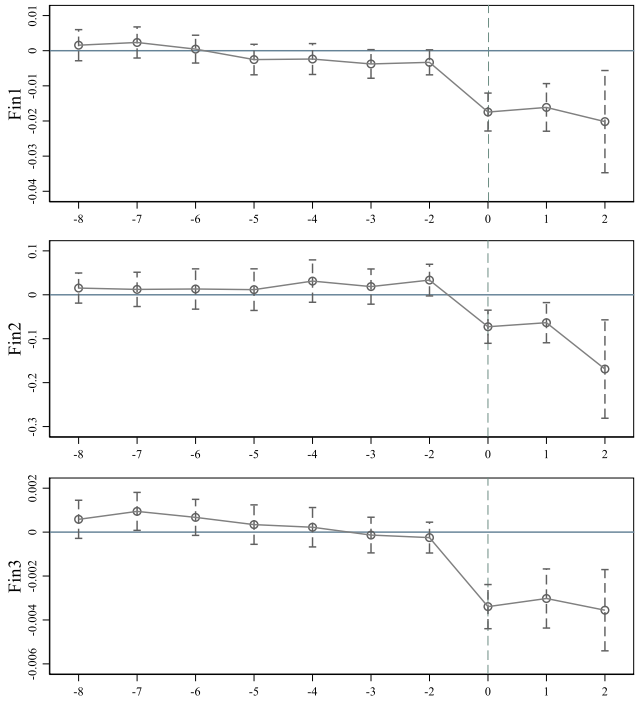


Fig. 4 – Parallel trends test. Source: own research

4.2.2 Replacing the explanatory variable

Given that the data for the technological blockade is largely concentrated in the lower range, with extreme values being rare but having a significant impact on the mean, the indicator may exhibit a certain degree of right-skewness. Therefore, this study further applies a logarithmic transformation to TB after adding 1, which smooths the data and reduces the impact of extreme values. The specific results, as shown in columns (1), (2), and (3) of Tab. 6, indicate that after replacing the explanatory variable, the coefficient for technological blockade (TB_ln) persists as negative at the 1% level. This validates the existence of both the scale effect and structural effect of technological

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blockade on firms' financial asset allocation.

Tab. 6 – Replacing the explanatory variable. Source: own research

VARIABLE	(1)	(2)	(3)
	$Fin1$	$Fin2$	$Fin3$
TB_ln	-0.007***	-0.069***	-0.001***
	(-4.131)	(-4.421)	(-3.226)
Obs	14387	14387	14387
Adj_R^2	0.458	0.276	0.409
F	7.506	82.73	3.343

4.2.3 Impact of the stock market crash

The 2015 stock market crash severely impacted business operations and investment activities in China, leading to issues such as overcapacity, export blockages, and declining profits. Therefore, the occurrence of the stock market crash may not only further exacerbate the impact of the technological blockade but also may cause significant fluctuations in firms' financial assets, particularly equity assets, which in turn affects the financial condition of firms. This study introduces a dummy variable, Shock, and examines the impact of the stock market crash on the relationship between technological blockade and firms' financial asset allocation by constructing an interaction term between TB and $Shock$. Considering that stock market recovery and the restoration of investor confidence take some time, the study defines the stock market crash period as 2016-2022. Consequently, Shock is assigned a value of 0 for the period 2012-2016 and a value of 1 for the period 2016-2022. The specific results, as shown in columns (1), (2), and (3) of Tab. 7, indicate that the regression coefficient of $TB \times Shock$ is significantly positive at the 1% level, suggesting that during the stock market crash period, the scale and structural effects of the technological blockade on firms' financial asset allocation remain significant, with the results still robust.

Tab. 7 – Impact of the stock market crash. Source: own research

VARIABLE	(1)	(2)	(3)
	$Fin1$	$Fin2$	$Fin3$
$TB \times Shock$	-1.295***	-13.533***	-0.288***
	(-4.511)	(-5.064)	(-3.742)
Obs	14387	14387	14387
Adj_R^2	0.458	0.277	0.409
F	7.849	83.31	3.573

4.2.4 Controlling for the impact of COVID-19

Given the outbreak of COVID-19, a major global public health crisis that has severely disrupted the global economy and corporate operations, it may have interfered with firms' financial asset allocation decisions. To more accurately identify the true effect of the technological blockade on firms' financial asset allocation, this section aims to

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eliminate the potential confounding impact of the pandemic. Considering that the pandemic began at the end of 2019, we use the year 2020 as a cutoff point and divide the sample into two periods: "Pre" and "Post". We then examine whether the impact of the technological blockade on firms' financial asset allocation remains robust across these periods. As shown in Tab. 8, before 2020, that is, before the outbreak of COVID-19, the technological blockade had a significant effect on both the scale and structure of firms' financial asset allocation. After 2020, under the compounding influence of the pandemic, the technological blockade only exhibited a significant scale effect. These results confirm that, even after controlling for the potential interference of the pandemic, the technological blockade continues to exert a significant impact on both the scale and structure of firms' financial asset allocation.

Tab. 8 – Controlling for the impact of COVID-19. Source: own research

VARIABLE	(1)	(2)	(3)	(4)	(5)	(6)
	$Fin1$		$Fin2$		$Fin3$	
	Pre	Post	Pre	Post	Pre	Post
TB	-0.458*	-1.324**	-10.938***	-9.257**	-0.064***	-0.376
	(-1.803)	(-2.037)	(-2.897)	(-2.091)	(-2.935)	(-1.588)
Obs	9247	4155	9247	4155	9247	4155
Adj_R^2	0.584	0.517	0.355	0.305	0.484	0.501
F	5.867	2.901	35.21	17.64	5.056	0.889

4.2.5 Considering changes in asset investment

The theory implies that technological blockades cause firms to cut back on financial asset holdings. With total assets held constant, there should be a trade-off between financial assets and physical assets. However, the firm's response strategy may not be limited to adjusting physical asset allocation; another possible strategy is to increase investment in R&D. Therefore, we further examine the changes in firms' physical assets and R&D investments. Specifically, this paper uses the sum of fixed assets and inventories divided by total assets as a proxy for physical asset holdings, denoted as $Physic$; meanwhile, the logarithm of R&D expenditure is used as a proxy for R&D investment, denoted as RD. In Tab. 9, we examine the impact of technological blockades on firms' holdings of physical assets and R&D investments. The results show that technological blockade not only leads to an increase in physical assets but also drives an increase in R&D investments. This result provides additional support for the main conclusion of this paper.

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Tab. 9 – Considering changes in asset investment. Source: own research

VARIABLE	(1)	(2)
	Physic	*RD*
TB	0.626*	11.522*
	(1.778)	(1.836)
Obs	14387	14387
Adj_R^2	0.928	0.579
F	1399	28.93

4.2.6 PSM test

Since not all firms are affected by the technological blockade, only specific types of companies (e.g., technology-dependent firms or firms from particular industries) may face direct impacts from the blockade, potentially leading to sample selection bias and insufficient causal inference. Thus, we employ PSM for robustness checks. First, firms are grouped according to whether their technological blockade index is positive, with a value above zero indicating inclusion in the treatment group and zero indicating assignment to the control group. Then, firm size, age, financial leverage, revenue growth rate, cash flow ratio, and fixed asset ratio are used as characteristics, with the nearest neighbor matching method applied for estimation. Tab. 10 presents the balance test results, indicating that the matching procedure narrows the mean differences of characteristic variables to within 10% post-matching. This confirms that the balance assumption is satisfied, with no significant differences observed between the two groups. The matching effect is thus valid. Tab. 11 further confirms that the baseline regression results remain unchanged after PSM matching.

Tab. 10 – Balance test of PSM. Source: own research

VARIABLE	Unmatched	Mean		%reduct		t-test	
	Matched	Treated	Control	%bias	bias	t	p>t
Size	U	21.87	21.827	4.2	70.9	1.39	0.166
	M	21.87	21.882	-1.2		-0.30	0.765
Age	U	2.901	2.789	33.2	98.6	10.63	0.000
	M	2.901	2.899	0.5		0.12	0.902
Lev	U	0.374	0.376	-1.2	-142.9	-0.33	0.739
	M	0.374	0.379	-2.5		-0.62	0.534
Growth	U	0.158	0.186	-8.2	94.9	-2.58	0.010
	M	0.158	0.157	0.4		0.11	0.915
Cash	U	0.053	0.045	12.4	95.2	3.96	0.000
	M	0.053	0.053	-0.6		-0.15	0.883
Fixed	U	0.215	0.197	13.4	79.1	4.33	0.000
	M	0.215	0.219	-2.8		-0.67	0.505

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Tab. 11 – PSM regression. Source: own research

VARIABLE	(1)	(2)	(3)
	$Fin1$	$Fin2$	$Fin3$
TB	-0.832***	-9.490***	-0.194**
	(-2.826)	(-2.862)	(-2.464)
Obs	5295	5295	5295
Adj_R^2	0.452	0.281	0.260
F	3.405	33.32	2.286

4.3 Endogeneity test

4.3.1 Heckman estimation

To further address sample selection bias, this study applies the Heckman two-step procedure. First, we estimate a Probit model using full-sample panel data to predict firms' probability of facing technological blockades and compute the Inverse Mills Ratio (IMR).In the second stage, the IMR is incorporated into the baseline regression to correct for selection bias. As reported in Tab. 12, the core explanatory variable remains significantly negative after the correction.

Tab. 12 – Heckman estimation. Source: own research

VARIABLE	(1)	(2)	(3)
	$Fin1$	$Fin2$	$Fin3$
TB	-2.058***	-15.522***	-0.364***
	(-3.766)	(-3.725)	(-2.579)
IMR	-0.026***	-0.001	-0.002
	(-3.454)	(-0.027)	(-1.099)
Obs	14387	14387	14387

4.3.2 Instrumental variables method

Although we have controlled for some firm-specific characteristics, the regression results may still be affected by endogeneity issues. To tackle this, we create an instrumental variable based on the concept of "industry sanction intensity × firm-level technological deviation" to mitigate endogeneity concerns. First, based on a manually compiled list of Chinese firms included in the entity list, we calculate the cumulative number of Chinese firms in the sample firm's industry that are listed in the Entity List in a given year, to reflect industry-level technological blockade pressure differences. Second, following the method proposed by Lewbel (1997), we calculate the cubed deviation between the firm's technological blockade level and the average level of other firms within the same industry and region. This indicator captures the heterogeneity of technological blockade intensity at the firm level, reflecting the firm's relative technological position within its industry and region. Finally, we multiply the industry-level sanction intensity by the firm-level technological deviation, which serves as the

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instrumental variable (*IV*) for this study. The technology spillover theory (Jaffe et al., 1993) posits that a firm's technological advancement depends not only on its R&D investment but also on the technological capabilities of peer firms within the same industry and geographic region. Consequently, this instrumental variable design captures both the exogenous shock characteristics at the industry level and incorporates firm-level heterogeneity, thereby effectively mitigating the potential omitted variable bias inherent in conventional instrumental variable approaches. Specifically, a larger positive value of the instrument indicates that the firm faces relatively stronger technological blockade pressure compared to its industry peers, whereas a smaller or negative value suggests relatively weaker exposure. Thus, the instrument variable meets the relevance requirement. Moreover, it does not directly influence the firm's financial asset allocation behavior, thereby satisfying the condition of exogeneity. However, we acknowledge that this instrumental variable may be correlated with industry-wide conditions (such as investment opportunities or financing climate) that could independently affect firms' financial asset allocation.

Additionally, based on firm-level patent citation data, a second instrumental variable is constructed to measure the historical dependence of firms on external technologies. Specifically, we calculate the proportion of foreign patent citations in each firm's total patent citations over the years. This reflects their prior international technology absorption, overseas patent linkages, and cross-border technology cooperation—a historically accumulated characteristic at the technological level that is closely related to the technological blockade pressure the firm faces through the technology lock-in effect. In contrast, firms' current financial asset allocation represents short-term financial decisions, primarily driven by current cash flow, operating risks, financing constraints, core business investment opportunities, and the macro-financial environment. Therefore, historical foreign citation intensity is unlikely to directly affect firms' current financial asset allocation decisions. However, the higher a firm's historical proportion of foreign patent citations, the greater its pressure for technological transformation under the technological blockade context, and the more likely it is to face substantial technological constraints. Nevertheless, historical technological linkages may still be correlated with persistent industry-level characteristics that could independently shape corporate financial behavior. Nonetheless, this instrumental variable offers supplementary supportive evidence.

The IV regression results in Tab. 13 show a significantly positive coefficient for the instrument in column (1), confirming its relevance to technological blockades. The F-statistic for the first stage exceeds 10, ensuring the instrument is not weak. Furthermore, the overidentification test rejects the null hypothesis of non-identification, verifying the instrument's validity. These results suggest that the instrument variable meets both the relevance and exogeneity requirements. After addressing potential endogeneity, the study's conclusions are robust.

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Tab. 13 – Instrumental variables method. Source: own research

VARIABLE	(1)	(2)	(3)	(4)
	TB	$Fin1$	$Fin2$	$Fin3$
$IV1$	14571***			
	(7.015)			
$IV2$	0.328***			
	(4.892)			
TB		-3.588***	-12.04**	-0.422***
		(-3.828)	(-2.267)	(-3.768)
Obs	14387	14387	14387	14387
LM test	7.795***			
Wald F test	50.351			

5 MECHANISM TESTING AND HETEROGENEITY ANALYSIS

5.1 Mechanism testing

5.1.1 Weakening of credit leverage

Technological blockades may worsen a company's credit rating and intensify financing constraints. In such cases, companies will face higher financing costs and more limited funding channels, further squeezing their financial asset allocation space. The KZ index is employed as a proxy variable to represent the weakening of credit leverage. Column (1) of Tab. 14 reports the regression results, showing a significantly positive TB coefficient at the 10% level. This indicates that technological blockades exacerbate financing constraints for companies, thereby compressing capital space. Furthermore, financing constraints caused by deteriorating credit ratings severely limit companies' preferences for financial assets. Therefore, the weakening of credit leverage appears to be a mechanism through which technological blockades influence firms' financial asset allocation, providing support for Hypothesis 2.

5.1.2 Crowding-out of supply chain funds

The external pressures brought about by technological blockades force companies to reduce costs, adjust production plans, or change product structures, which affect their relationships with upstream and downstream partners and may lead to a funding squeeze in the supply chain. This, in turn, weakens their ability to operate in capital markets. This paper uses the standardized difference between the sum of accounts payable and receivable as a proxy for the crowding-out of supply chain funds ($Crowd$). Tab. 14, column (2) reports that TB is positive at the 1% level. This suggests that technological blockades cause companies to allocate more funds to cash flows and bill payments. The resulting funding pressure further increases firms' capital market pressure, forcing them to reduce their financial assets and optimize their allocation structure. Thus, the crowding-out of supply chain funds represents a potential mechanism through which technological blockades relate to firms' financial asset

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allocation, lending support to Hypothesis 3.

5.1.3 Deepening of business barriers

In response to technological blockade, companies may shift their strategic focus to enhancing core competitiveness and improving technological self-reliance by strengthening core business advantages to cope with external shocks. This shift will prompt companies to reassess and adjust their financial asset allocation strategies. This paper uses the number of subsidiaries owned as a proxy for the deepening of business barriers (DBB). The regression results are shown in column (3) of Tab. 14, where the coefficient of TB is significantly negative at the 10% level. This suggests that technological blockades prompt companies to strengthen business barriers by optimizing and refocusing the scope of their business activities. Related studies also suggest that building core business barriers can further reduce the preference for financial assets (Bebchuk & Weisbach, 2010). These results indicate that the deepening of business barriers serves as a key channel through which technological blockades are linked to firms' financial asset allocation, validating Hypothesis 4.

5.1.4 Competitiveness Weakening

To examine whether technological blockades affect firms' financial asset allocation by weakening their competitiveness, this study constructs a comprehensive corporate competitiveness indicator using the entropy method, integrating five dimensions: core technological reserves, total factor productivity (TFP), market share, R&D intensity, and patent quality. Elevated scores on this metric denote stronger overall competitiveness. The regression results, as shown in column (4) of Tab. 14, indicate that the coefficient for technological blockade (TB) is significantly negative at the 5% level, suggesting that technological blockades significantly weaken firms' comprehensive competitiveness. Existing research demonstrates that a decline in corporate competitiveness compresses profit margins and long-term growth potential, thereby prompting a shift toward more conservative asset allocation strategies (Aghion et al., 2005). These outcomes point to the weakening of competitiveness as a transmission mechanism through which technological blockades are associated with firms' financial asset allocation, supporting Hypothesis 5.

Tab. 14 – Mechanism testing. Source: own research

VARIABLE	(1)	(2)	(3)	(4)
	KZ	$Crowd$	DBB	$Comp$
TB	14.923*	2.104***	-158.156*	-0.475**
	(1.803)	(3.631)	(-1.710)	(-2.028)
Obs	14387	14387	14387	14387
Adj_R^2	0.791	0.865	0.783	0.771
F	934.5	12.31	37.74	76.82
Sobel Z	-2.114	2.473	-2.301	-2.397
p-value	0.035	0.013	0.021	0.017

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5.2 Heterogeneity analysis

5.2.1 Heterogeneity of core technology reserves

The level of core technology endowment plays a crucial role in shaping firms' responses to technological blockades and their capital allocation decisions. Based on the "Industry Foundation Innovation Development Directory (2021 Edition)", this research selects 1,047 technologies across 21 core technical sectors listed therein. Combined with patent data from CNIPA, this study matches keywords of core technologies with five-digit IPC codes to confirm corresponding classification numbers. On this basis, we calculate annual firm-level patent applications in these key technical areas. Meanwhile, we recognize that external technological blockades represent not only firm-level constraints but also industry-wide shocks. Such blockades induce firms to intensify R&D investment and accumulate core technologies, thereby promoting the diffusion of these technologies within the industry and alleviating the pressure brought by external blockades to some extent. Therefore, we further compile the total reserves of core technologies in the industry in which the firm is located and divide the sample into two categories: "firms with high core technology reserves" (High reserve) and "firms with low core technology reserves" (Low reserve), based on whether the reserve quantity is zero or not.

Tab. 15 presents the results. Columns (1), (3), and (5) indicate that in firms with high core technology reserves, the coefficients of TB are not significant. However, the results in columns (2), (4), and (6) show that in firms with low core technology reserves, the coefficient of TB is -1.239, -12.092, and -0.260, respectively, all of which are significantly negative at the 1% level. This means that each standard deviation increase in technological blockade intensity reduces financial asset ratios by 1.239 and returns by 12.092 standard deviations, while increasing diversification by 0.260. This suggests that, compared to firms with high core technology reserves, the scale and structural effects of technological blockades on financial asset allocation are more pronounced in firms with low core technology reserves. The possible reason is that firms with higher core technology reserves generally have stronger independent R&D capabilities and technological barriers, enabling them to better cope with external technological blockades. Additionally, these firms benefit from advantages in cost control, market size, and customer relationships, providing them with larger financial resources to expand overall returns. In contrast, firms with fewer technology reserves are more vulnerable to uncertainty shocks. These firms need to invest more in technology, supply chain management, and joint R&D to strengthen resilience and ensure smooth operations (Grossman et al., 2023), which further compresses their financial asset allocation space.

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Tab. 15 – Heterogeneity of core technology reserves. Source: own research

VARIABLE	(1)	(2)	(3)	(4)	(5)	(6)
	$Fin1$		$Fin2$		$Fin3$	
	High reserve	Low reserve	High reserve	Low reserve	High reserve	Low reserve
TB	0.175	-1.239***	-2.194	-12.092***	0.011	-0.260***
	(0.499)	(-4.359)	(-0.388)	(-4.523)	(0.358)	(-3.367)
Obs	2542	11364	2542	11364	2542	11364
Adj_R^2	0.654	0.448	0.474	0.255	0.659	0.411
F	1.077	7.604	6.913	69.63	1.172	3.172

5.2.2 Heterogeneity of TFP

A firm's total factor productivity (TFP) serves as a comprehensive indicator of production efficiency, technological capability, and adaptive flexibility in response to external shocks. Enterprises with different TFP levels may exhibit systematic differences in financial asset allocation decisions when facing external uncertainties such as technological blockade. Therefore, the sample is split into high-TFP and low-TFP groups at the median to examine heterogeneity in the impact of technological blockades on financial asset allocation.

The regression results in Tab. 16 show that TFP significantly moderates the relationship between technological blockade (TB) and firms' financial asset allocation. For firms with higher TFP (columns (1), (3), and (5)), the coefficients of TB are negative but statistically insignificant, indicating that high-TFP firms do not undergo significant scale or structural adjustments in their financial asset allocation when facing external technological shocks. This may be because high-TFP firms generally possess stronger technological innovation capabilities, production flexibility, and risk resilience, enabling them to buffer external shocks through internal optimization and efficiency improvements. In contrast, for firms with lower TFP (columns (2), (4), and (6)), the impact of technological blockade is more pronounced: the coefficients of TB on financial asset scale (Fin1), returns (Fin2), and diversification (Fin3) are -1.246, -12.449, and -0.330, respectively, all significant at the 1% level. This suggests that, when confronted with technological blockade, low-TFP firms significantly reduce the scale of financial asset allocation, lower related returns, and increase the degree of asset diversification. Such firms, likely due to limited technology absorption capacity and relatively low production efficiency, tend to respond to external uncertainties through structural optimization and risk diversification of financial assets.

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Tab. 16 – Heterogeneity of TFP. Source: own research

VARIABLE	(1)	(2)	(3)	(4)	(5)	(6)
	$Fin1$		$Fin2$		$Fin3$	
	High	Low	High	Low	High	Low
TB	-0.868**	-1.246***	-11.358***	-12.449***	-0.134**	-0.330***
	(-2.494)	(-3.189)	(-3.433)	(-3.288)	(-2.150)	(-2.917)
Obs	6747	7039	6747	7039	6747	7039
Adj_R^2	0.503	0.429	0.265	0.303	0.357	0.402
F	6.588	3.216	30.14	45.17	4.169	1.888

5.2.3 Heterogeneity of market share

Firms with different market positions may demonstrate differentiated resource allocation capabilities and risk response strategies. To examine heterogeneous impacts across firms with different market shares, this study divides the sample into the "high market share group" (High) and the "low market share group" (Low) based on the median market share.

The regression results in Tab. 17 indicate that the level of market share significantly moderates the relationship between technological blockades and firms' financial asset allocation. For firms with high market share (columns (1), (3), and (5)), the coefficients of technological blockade (TB) on financial asset scale (Fin1), returns (Fin2), and diversification level (Fin3) are -1.045, -8.224, and -0.171, respectively, all significant at the 5% or 1% level. This suggests that, when facing technological blockade, high market share firms significantly reduce the scale and returns of financial assets while enhancing the diversification of asset allocation. This may stem from their stronger bargaining power and broader resource allocation channels in the market, enabling them to proactively optimize financial asset structures in response to external uncertainties brought by technological blockades.

For firms with low market share (columns (2), (4), and (6)), technological blockade (TB) also exerts significant negative effects on financial asset scale (Fin1) and returns (Fin2), with coefficients of -1.147 and -12.792, respectively, both significant at the 1% level. The coefficient for asset diversification (Fin3) is -0.272, also significant at the 1% level. This indicates that low market share firms, while also reducing the scale and returns of financial asset allocation and increasing diversification in response to technological shocks, exhibit differences in adjustment magnitude and structural characteristics compared to high market share firms. Due to their weaker market position and constrained access to resources, these firms are more inclined to prioritize operational stability by compressing financial asset holdings and limiting exposure to risk, thereby exhibiting relatively defensive adjustment behavior.

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Tab. 17 – Heterogeneity of market share. Source: own research

VARIABLE	(1)	(2)	(3)	(4)	(5)	(6)
	$Fin1$		$Fin2$		$Fin3$	
	High	Low	High	Low	High	Low
TB	-1.045**	-1.147***	-8.224**	-12.792***	-0.171***	-0.272***
	(-2.495)	(-3.590)	(-2.210)	(-4.065)	(-3.480)	(-2.830)
Obs	6321	7821	6321	7821	6321	7821
Adj_R^2	0.526	0.440	0.327	0.271	0.335	0.418
F	7.001	3.619	24.15	55.52	5.143	1.910

5.2.4 Heterogeneity of R&D

The level of a firm's research and development (R&D) expenditure captures a firm's innovation capability and long-term strategic orientation, which may influence its asset allocation strategy in response to external technological shocks. Using median R&D expenditure, the sample is divided into high and low R&D investment groups to examine heterogeneous effects.

The regression results in Tab. 18 show that R&D intensity significantly moderates the relationship between technological blockade and firms' financial asset allocation. For high R&D investment firms (columns (1), (3), and (5)), the coefficients of technological blockade (TB) on financial asset scale (Fin1), returns (Fin2), and diversification level (Fin3) are -0.897, -9.747, and -0.179, respectively, all significant at the 1% level. This indicates that, when facing technological blockade, high R&D investment firms significantly reduce the scale and returns of financial assets while simultaneously increasing the diversification of asset allocation. This may be because firms with higher R&D investment typically possess stronger technological innovation capabilities, allowing them to proactively adjust their financial asset structures through diversified risk mitigation while maintaining continuous investment in core R&D activities when external technologies are constrained. For low R&D investment firms (columns (2), (4), and (6)), the impact of technological blockade (TB) on financial asset scale (Fin1), returns (Fin2), and diversification (Fin3) is even more pronounced, with coefficients of -1.286, -13.173, and -0.317, respectively, all significant at the 1% or 5% levels. Notably, low R&D investment firms are affected more severely by technological blockades than high R&D investment firms. This may be due to their relatively weaker technological innovation and knowledge accumulation, which leaves them with limited internal buffering capacity against external technological shocks. Consequently, these firms tend to prioritize short-term operational stability, primarily by compressing financial asset holdings and tightening risk exposure. High R&D investment firms demonstrate more rational and structured adjustment strategies, balancing risk control with developmental continuity(Konstari & Valkokari, 2025). In contrast, low R&D investment firms exhibit more passive and defensive adjustment characteristics, with greater adjustment magnitudes but potentially less strategic foresight.

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Tab. 18 – Heterogeneity of R&D. Source: own research

VARIABLE	(1)	(2)	(3)	(4)	(5)	(6)
	$Fin1$		$Fin2$		$Fin3$	
	Positive	Negative	Positive	Negative	Positive	Negative
TB	-0.897***	-1.286***	-9.747***	-13.173***	-0.179***	-0.317**
	(-2.596)	(-3.008)	(-2.791)	(-3.344)	(-3.586)	(-2.430)
Obs	6765	6941	6765	6941	6765	6941
Adj_R^2	0.506	0.447	0.256	0.323	0.331	0.408
F	4.874	3.667	29.88	43.65	4.289	1.937

5.2.5 Heterogeneity of patent quality

Patent quality reflects a firm's level of technological innovation and intellectual property strength, which may influence its resource allocation decisions and risk mitigation capabilities in the face of external technological blockades. To systematically examine the heterogeneous impact of technological blockades on the financial asset allocation of firms with different patent qualities, this study employs the knowledge breadth method to measure corporate patent quality. The full sample is then divided into a "high patent quality group" and a "low patent quality group" based on the median value, allowing for a comparative analysis of the effects of technological blockades on financial asset scale, returns, and structure across the two groups.

The regression results in Tab. 19 indicate that patent quality significantly moderates the relationship between technological blockades and corporate financial asset allocation. For firms with high patent quality (columns (1), (3), and (5)), technological blockade (TB) exerts a significant negative impact on financial asset scale (Fin1), returns (Fin2), and diversification level (Fin3), with coefficients of -1.228 ($p < 0.01$), -9.462 ($p < 0.01$), and -0.262 ($p < 0.05$). This suggests that, when confronted with technological blockades, high patent quality firms can simultaneously implement scale control, returns adjustment, and structural optimization, demonstrating a more comprehensive and proactive adjustment capability. Such firms typically possess a broader foundation of technical knowledge and stronger patent portfolio capabilities, enabling them to leverage their technological resilience to proactively restructure asset allocation for risk diversification and resource reallocation in the face of external shocks. In the low patent quality firm sample (columns (2), (4), and (6)), technological blockades also have a significant impact on financial asset scale (Fin1) and returns (Fin2), with coefficients of -0.763 (significant at the 5% level) and -13.381 (significant at the 1% level), respectively. Notably, the decline in returns is significantly greater than that observed in the high patent quality group. However, the effect of technological blockades on asset diversification (Fin3) does not pass the significance test. This indicates that, under the impact of technological blockades, low patent quality firms focus more on controlling asset scale and stabilizing returns, while failing to effectively advance the diversification of their asset structures. Such firms may be constrained by their narrower

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technical knowledge base and weaker patent reserves, making them more sensitive to external technological shocks. Consequently, they tend to adopt more conservative and defensive financial strategies, primarily mitigating uncertainty through scale contraction rather than structural reallocation, with limited capacity for portfolio diversification and optimization.

Tab. 19 – Heterogeneity of patent quality. Source: own research

VARIABLE	(1)	(2)	(3)	(4)	(5)	(6)
	$Fin1$		$Fin2$		$Fin3$	
	High	Low	High	Low	High	Low
TB	-1.228***	-0.763**	-9.462***	-13.381***	-0.262**	-0.105
	(-3.489)	(-2.311)	(-2.768)	(-3.400)	(-2.502)	(-1.317)
Obs	6255	6598	6255	6598	6255	6598
Adj_R^2	0.478	0.466	0.249	0.318	0.193	0.547
F	4.084	3.430	28.45	38.74	2.409	2.219

6 FURTHER ANALYSIS

6.1 Moderating Effect Analysis

Firstly, Supply chain concentration (SCC) captures a firm's reliance on a single or limited number of suppliers, calculated as the average procurement and sales proportions of its top five suppliers and customers. A higher value signals greater concentration. The results in Tab. 20 show interaction term coefficients of 0.065, 0.331, and 0.012, all significant, meaning that each standard deviation decrease in supply chain concentration amplifies the scale effect of technological blockades by 0.065 and 0.331 standard deviations, and the structural effect by 0.012 standard deviations. These findings indicate that lower supply chain concentration strengthens the overall impact of technological blockades on both the scale and structural dimensions of financial asset allocation. The possible explanation is that, under high supply chain concentration, companies typically rely on a few suppliers for key technologies or raw materials (Ak & Patatoukas, 2016). When these suppliers implement technological blockades, companies may face shortages of technology and resources, prompting them to seek external capital or enhance capital market operations, which increases the inclination for financial asset allocation. In contrast, a more diversified supply chain expands access to information and technology (Farzaneh et al., 2022), enabling companies to achieve endogenous growth and technological accumulation through independent innovation, thus compressing the space for financial asset allocation.

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Tab. 20 – Effects of supply chain concentration. Source: own research

VARIABLE	(1)	(2)	(3)
	$Fin1$	$Fin2$	$Fin3$
$SCC \times TB$	0.065***	0.331*	0.012***
	(3.132)	(1.660)	(3.418)
Obs	14378	14378	14378
Adj_R^2	0.458	0.276	0.409
F	7.189	65.91	3.421

Next, this study further examines how digital transformation moderates the impact of technological blockades on corporate financial asset allocation. Drawing on existing research, this paper employs text analysis to construct a digital transformation indicator (DIG) based on the frequency of digital-related terms in corporate annual reports and standardizes it. Tab. 21 reports that the interaction term ($DIG \times TB$) has coefficients of -0.413, -3.244, and -0.106 for financial asset scale (Fin1), returns (Fin2), and diversification (Fin3), respectively, all statistically significant. This indicates that digitization strengthens the inhibitory effect of technological blockade on financial asset allocation, with each standard deviation increase in digital transformation amplifying the scale, return, and structural inhibition effects by 0.413, 3.244, and 0.106 standard deviations, respectively.

A possible explanation is that highly digitalized firms possess stronger capabilities in data integration, process transparency, and supply-chain coordination, which enhances their ability to identify risks, optimize asset structures, and implement precise controls when facing technological blockades. Specifically, digital transformation, on one hand, lowers the adjustment costs of reallocating resources from financial assets to innovation investments, making it economically feasible to substitute long-term technological development for short-term financial holdings; on the other hand, it enhances firms' absorptive capacity and collaborative innovation efficiency, enabling them to convert external technological pressure into internal R&D impetus through supply chain integration and collaborative innovation. These two mutually reinforcing mechanisms collectively amplify the scale and structural effects of technological blockades on financial asset allocation. Consequently, these firms can proactively reduce high-risk financial asset allocations while maintaining operational flexibility. In contrast, firms with lower levels of digitalization face challenges in information perception and decision-making(Enri-Peiró et al., 2025; Geske et al., 2025), tending to rely on traditional financing channels and asset restructuring to cope with external shocks, thus exhibiting greater path dependence and defensive characteristics in their financial asset allocation strategies. These findings further suggest that firms' asset allocation responses to external shocks are closely aligned with their long-term strategic orientation, with digitally-enabled firms exhibiting patterns consistent with competitiveness-building(Ling et al., 2025), rather than merely short-term survival.

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Tab. 21 – Effects of digital transformation. Source: own research

VARIABLE	(1)	(2)	(3)
	$Fin1$	$Fin2$	$Fin3$
$DIG \times TB$	-0.413***	-3.244*	-0.106**
	(-2.676)	(-1.895)	(-2.267)
Obs	13727	13727	13727
Adj_R^2	0.462	0.280	0.241
F	8.375	63.93	4.244

Finally, this study further examines whether industry-university-research (IUR) collaboration moderates the effect of technological blockades on financial asset allocation. Using the standardized number of collaborative patents as a measure of IUR depth, Tab. 22 shows that the interaction term ($IUR \times TB$) yields coefficients of -0.117, -0.850, and -0.021 for financial asset scale, returns, and diversification, respectively, all statistically significant. This indicates that as IUR collaboration deepens, the inhibitory effect of technological blockade on financial asset allocation is significantly enhanced. Specifically, each standard deviation increase in collaborative patent count amplifies the scale, return, and structural inhibition effects by 0.117, 0.850, and 0.021 standard deviations, respectively.

Firms with stronger IUR collaboration possess enhanced innovation capabilities and knowledge networks, enabling them to better access complementary technologies and accelerate technological substitution under blockade pressures, thereby reducing reliance on financial assets. The open innovation system fostered through IUR collaboration also enhances firms' control over key industrial chain segments, allowing for more proactive and forward-looking asset allocation decisions. This advantage is reflected in two aspects. First, IUR collaboration reduces the external dependence cost of technology acquisition. When commercial channels are blocked, partnerships with universities and research institutes provide stable, low-cost alternative technology sources, reducing firms' demand for financial assets as a hedge against uncertainty. Second, IUR collaboration enhances firms' technology absorption and transformation capabilities through knowledge spillovers and joint R&D, enabling them to rapidly internalize external pressure into independent innovation momentum, thereby converting financial assets into core technology development funding. These two mechanisms mutually reinforce each other, collectively encouraging firms to channel resources into core technology R&D rather than pursuing financialization returns. In contrast, firms with weaker IUR ties face greater technological constraints and fewer alternative innovation pathways, leading them to seek short-term returns through financial asset allocation and exhibiting stronger financialization tendencies when responding to technological blockades. Overall, these results highlight that firms' strategic asset allocation responses to external technological constraints are closely linked to their long-term competitiveness trajectories, with IUR-enabled firms aligning behavior with sustained capability development.

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Tab. 22 – Effects of IUR Collaboration. Source: own research

VARIABLE	(1)	(2)	(3)
	$Fin1$	$Fin2$	$Fin3$
$IUR \times TB$	-0.117**	-0.850*	-0.021*
	(-2.244)	(-1.959)	(-1.664)
Obs	14317	14317	14317
Adj_R^2	0.457	0.277	0.409
F	6.788	65.42	2.936

6.2 Ripple effect of supply chain

In light of technological spillovers and risk contagion, this study examines whether technological blockades generate a "ripple effect" on financial asset allocation across different tiers of the supply chain. Using the original sample data, we developed a new dataset that pairs upstream firms, focal firms, and downstream firms for a more detailed analysis. Specifically, this study extracts detailed information on the top five suppliers and customers of sample firms from the database of listed company supply chains. Due to the limited availability of operational and financial data for non-listed companies, and to ensure the completeness and comparability of sample data, we exclude firms whose suppliers and customers are entirely non-listed entities, and retain only observations with both listed suppliers and listed customers. Based on this, we constructed a complete paired observation dataset of "upstream firm-focal firm-downstream firm" among listed companies. Therefore, the findings presented below are primarily applicable to supply chain networks consisting of listed companies.

6.2.1 Forward linkage of technological blockade

We investigate how technological blockades imposed by downstream firms influence the financial asset allocation of the focal firm, and conversely, how the focal firm affects the downstream firms. The results in Tab. 23 demonstrate that when downstream firms encounter technological blockades, the focal firm exhibits an increased financial asset allocation ratio with a more concentrated allocation structure, revealing inverse scale and structure effects. Conversely, when the focal firm faces technological blockades, it leads to decreased financial asset allocation among downstream firms, showing predominantly scale effects without significant structural adjustment. The underlying mechanism may be that technological blockades impose multiple challenges on downstream firms, including shrinking market share, declining production efficiency, and heightened financial pressures (Acemoglu et al., 2012), thereby reducing their order demand from the focal firm or even triggering contract defaults. To mitigate such shocks, the focal firm reallocates excess production capacity toward financial investments to rebalance its overall asset portfolio. Conversely, technological blockades raise operational costs and undermine the innovation capabilities of the focal firm, exposing downstream firms to supply shortages or potential supply chain disruptions. In response, downstream firms may reduce financial asset allocations and

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redirect resources toward diversifying supply chain relationships or strengthening internal capabilities to decrease reliance on the focal firm, while maintaining their existing allocation structure.

Tab. 23 – Forward linkages of technological blockades. Source: own research

VARIABLE	(1)	(2)	(3)	(4)	(5)	(6)
	$Fin1$	$Fin2$	$Fin3$	$Fin1down$	$Fin2down$	$Fin3down$
$TBdown$	0.483*	0.527	0.266***			
	(1.894)	(0.065)	(2.847)			
TB				-2.127***	128.323	-0.095
				(-2.717)	(0.555)	(-0.167)
Obs	1162	1162	1187	1153	1153	1153
Adj_R^2	0.831	0.493	0.732	0.897	0.168	0.0402
F	1.882	2.672	1.933	2.316	0.163	0.574

6.2.2 Backward linkage of technological blockade

We explore the impact of upstream firms' technological blockade on the financial asset allocation of the focal firm, as well as the impact of the focal firm's technological blockade on the financial asset allocation of upstream firms. The results in Tab. 24 show that the bidirectional spillover of technological blockade and financial asset allocation between upstream firms and the focal firm primarily manifests as scale effects, rather than structural effects. The possible explanation is that when suppliers are subject to a technological blockade, the focal firm may face issues such as limited access to advanced technology, raw materials, or equipment, leading to restricted R&D, production delays, and market shrinkage (Carvalho et al., 2021). In this situation, the focal firm has insufficient motivation or space to change its asset allocation structure, and instead adjusts its financial asset allocation primarily through scale contraction rather than structural reconfiguration. Conversely, when the focal firm itself faces a technological blockade, its strategic adjustments will reduce dependence on a single supplier, leading to a reduction in orders from upstream suppliers. In this case, upstream firms are more likely to liquidate financial assets as a liquidity buffer to sustain operational continuity and core production activities. Since the returns from diversified financial asset allocation are generally slow, they cannot quickly address the current predicament, thus preventing a change in the financial asset allocation structure.

Tab. 24 – Backward linkages of technological blockades. Source: own research

VARIABLE	(1)	(2)	(3)	(4)	(5)	(6)
	$Fin1$	$Fin2$	$Fin3$	$Fin1up$	$Fin2up$	$Fin3up$
$TBup$	-1.000*	-31.449*	0.056			
	(-1.821)	(-1.692)	(0.305)			
TB				-2.775**	-28.667*	-0.271
				(-2.051)	(-1.834)	(-0.474)
Obs	1162	1162	1187	1127	1127	1139

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Adj_R^2	0.832	0.500	0.728	0.778	0.410	0.354
F	2.275	3.202	0.598	1.696	3.035	0.921

7 CONCLUSION AND POLICY RECOMMENDATIONS

Recently, the intensification of global technological competition has become a key opportunity for firms to revise their asset allocation. While prior studies have examined the impacts of climate risk (Ning et al., 2025) and macroeconomic volatility (Arellano et al., 2019), the effects of technological blockades stemming from geopolitical competition on firms' financial asset allocation remain underexplored. This study rectifies this void by utilizing panel data from A-share listed enterprises (2012-2022), empirically interrogating the linkage between technological blockades and corporate financial asset allocation. The investigation unveils the following: First, technological blockades are associated with notable scale-structure dual effects on firms' financial asset allocation. Each standard deviation increase in technological blockade intensity reduces financial asset ratios and returns by 1.084 and 11.742 standard deviations, respectively, while increasing diversification by 0.235 standard deviations. These patterns hold even after addressing endogeneity and conducting robustness tests. Second, in firms with low core technology reserves, lower TFP, lower market share, lower R&D intensity, and lower patent quality, both scale and structural effects are more pronounced. Third, technological blockades primarily influence firms' financial asset allocation through mechanisms such as the weakening of credit leverage, the crowding-out of supply chain funds, the deepening of business barriers, and the weakening of competitiveness. Fourth, structural features such as lower supply chain concentration, stronger digital transformation, and greater Industry-University-Research collaboration amplify the scale and structural effects of technological blockades on financial asset allocation. This study extends resource dependence theory and dynamic capability theory to the context of technological blockades by explicitly distinguishing between scale and structural effects. Furthermore, it provides a novel measurement approach by constructing a firm-perceived technological blockade index. These findings challenge the conventional view that external shocks uniformly intensify corporate financialization (Demir, 2009), suggesting that technological blockades may redirect firms toward real-economy investments. This study offers insights into the micro-mechanisms through which technological blockades may relate to firms' financial asset allocation via knowledge-driven strategic adaptations. By analyzing the scale-structure changes in financial asset allocation, it describes enterprises' strategic responses when confronting external technological blockades. Through elaborating on the financialization adjustment mechanisms under technological pressure, the research findings provide theoretical explanations and policy implications for emerging market countries to address technological competition dilemmas and financialization tendencies. Meanwhile, they offer theoretical references and practical guidance for firms to maintain financial resilience while navigating innovation constraints.

The policy recommendations proposed in this study are as follows: First,

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competitiveness enhancement should serve as the central objective of policy design. The government is advised to establish a Competitiveness Enhancement Fund, providing targeted R&D subsidies to firms with technological gaps. Furthermore, it is essential to promote the integration of industrial and innovation chains through dedicated platforms that facilitate technology diffusion and collaborative innovation. Secondly, differentiated policies should be implemented based on firm-specific competitiveness profiles. For technologically weak firms, support should focus on technology introduction, assimilation, and absorption. For growth-stage firms, policy should encourage capital market financing and sustain long-term R&D investment. For mature firms, efforts should be directed toward fostering participation in international standard-setting to enhance global competitiveness. Additionally, a risk monitoring and early warning system should be established, with the implementation of a "chain leader" system for key industries, alongside targeted financing support and supply chain matching services for SMEs. Lastly, enterprises should focus on long-term strategic planning, increase investment in core technologies, and reduce reliance on short-term financial assets. In addition, diversified financing channels should be developed to alleviate capital constraints and support sustained innovation investment.

Limitations: the supply-chain ripple results are based on a relatively small matched triad sample, and concerns about common shocks (e.g., industry-wide or macroeconomic conditions) cannot be fully ruled out. Hence, the results only provide tentative evidence for supply chain networks of listed enterprises, instead of definite causal spillover effects. Future research could employ larger-scale supply-chain matched samples or combine more refined causal identification methods (e.g., natural experiments or shock events) to further validate the existence and transmission mechanisms of supply-chain ripple effects.

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