

Cross-Listing, Innovation Financing and New Quality Productive Forces—Empirical Evidence from Chinese Listed Enterprises

Minjian Qiao *, Lishuo Liang, Kang Ma and Jiacheng Yin

College of Economics, Hebei University, Baoding 071002, China

Abstract: Under the new development pattern, cross-listing serves as a crucial means for enterprises to integrate capital market resources at home and abroad, and it is also an important approach to promote the improvement of new quality productive forces. Based on the sample of Chinese listed enterprises from 2015 to 2023, this paper systematically analyzes the effect and influencing mechanism of cross-listing on enterprises' new quality productive forces from both theoretical and empirical perspectives. The research results show that: (1) Cross-listing has a significant positive impact on the improvement of enterprises' new quality productive forces, and this conclusion still holds after multi-dimensional robustness tests; (2) For large-scale enterprises, high-tech enterprises, and enterprises in regions with a high degree of marketization, cross-listing exerts a more prominent promoting effect on the upgrading of new quality productive forces; (3) Cross-listing improves new quality productive forces by raising the level of corporate innovation financing; (4) The promotional effect of cross-listing on new quality productive forces is persistent and presents a dynamically strengthening trend as the listing duration of enterprises increases. The conclusions of this study provide micro-level empirical evidence for enterprises to foster new quality productive forces and for the opening up of the capital market.

Keywords: cross-listing; new quality productive forces; innovation financing level

1. Introduction

At present, the global digital technology revolution is profoundly reshaping the world power structure. Some Western countries, led by the United States, are leveraging their technological advantages to encircle and restrict China through strategic containment, technological decoupling, and regulatory suppression, thereby hindering China's technological innovation. China also stands at a historical intersection marked by the alternation of technological and industrial revolutions, intensified major power competition, and the transformation of the economic development model. How to gain a commanding position and achieve leapfrog development in the new round of technological and industrial revolutions is an urgent practical issue that China needs to address. Focusing on the current international landscape, General Secretary Xi, after assessing the situation, creatively proposed the theoretical proposition of developing 'new quality productive forces', emphasizing that 'developing new quality productive forces is an inherent requirement and important focus for promoting high-quality development'. New quality productive forces, as an advanced form of productivity jointly generated by key technological breakthroughs, innovative allocation of production factors, and deep industrial transformation,

are highly dependent on continuous investment in technological innovation and an efficient resource allocation mechanism, with financing support from capital markets serving as the crucial link between the two. Since 2024, the China Securities Regulatory Commission (CSRC) has successively issued policy documents such as the “Sixteen Measures to Support the High-Quality Development of Technology Enterprises in Capital Markets” and the “Eight Measures to Deepen the Reform of the Sci-Tech Innovation Board and Serve the Development of Technological Innovation and New Quality Productive Forces”. These measures have established a financing support system covering the full lifecycle of technology-based enterprises, explicitly positioning the cultivation of new quality productive forces as a key focus of the multi-level capital market reform.

Among them, new quality productive forces take innovation as their distinctive feature [1]. At the government level, policies actively guide enterprises to participate in various science and technology projects and tackle core technologies in key industries [2], and stimulate enterprises’ innovation vitality through government subsidies and other channels, thereby elevating the level of new quality productive forces [3]. Meanwhile, at the enterprise level, enterprises effectively enhance their new quality productive forces by increasing investment in innovation, focusing on strengthening the application of data factors, and accelerating the process of enterprise digital transformation [4,5]. However, in practice, due to the incomplete development of the domestic capital market and insufficient support from venture capital for corporate innovation and entrepreneurship [6], enterprises—especially technology-based ones—generally face the challenges of high innovation costs, long return cycles, and inadequate risk-sharing mechanisms [7,8]. The financing constraints and governance limitations of the traditional single capital market have also become bottlenecks hindering the leapfrog development of new quality productive forces. Meanwhile, cross-listing—where a company issues securities simultaneously in multiple domestic and foreign markets—can effectively address the financing and governance limitations of a single market, serving as a key pathway to promote the growth of new quality productive forces. According to data from the Wind database, as of the end of 2024, a total of 151 companies were cross-listed on China’s A-shares and Hong Kong’s H-shares (referred to as “A + H cross-listed stocks”). Compared with A-share companies listed only on a single market, cross-listed enterprises face differentiated institutional and market constraints, enjoy broader investor attention [9], stricter information disclosure regulatory systems [10], and more robust investor protection mechanisms [11], thereby enabling cross-listed enterprises to effectively alleviate information asymmetry, reduce transaction costs, restrain excessive expansion of the company’s investment in innovative capital, and reduce ineffective R&D investment [12]. Cross-listing can also broaden a company’s financing channels [13], enhance capital liquidity [14], and improve the liquidity and pricing efficiency of its stocks [15], in this way, it alleviates corporate financing constraints and provides sustained capital support for corporate innovation activities, thereby laying a solid capital foundation for enhancing the level of new quality productive forces. At the same time, the process of cross-listing is also a process for companies to benchmark against overseas capital market rules. Cross-listing behavior is an integral part of China’s opening-up, and advancing high-level opening-up further promotes the growth of new quality productive forces [16–18].

Existing research has shown that new quality productive forces are characterized by innovation, that corporate cross-listing can provide capital support for innovation activities, and that high-level opening-up can promote the growth of new quality productive forces. These studies provide a solid foundation for this paper. However, comprehensive review reveals that few studies have explored the impact and mechanisms of opening-up on new quality productive forces from the micro perspective of corporate cross-listing. Based on data from Chinese listed companies from 2015 to 2023, this paper incorporates cross-listing and corporate new quality productive forces into a unified analytical framework, systematically examining the effects and mechanisms of cross-listing on new quality productive forces. This paper aims to enrich the relevant literature in the following aspects: (1) Breaking through traditional research perspectives, constructing a theoretical analytical framework for the impact of cross-listing on corporate new quality productive forces, and revealing the driving logic of dual listing systems in capital markets on corporate core competitiveness cultivation; (2) Introducing the level of innovation financing as a mechanism variable, uncovering the logical relationship among cross-listing, innovation financing, and the enhancement of new quality productive forces, and providing new evidence on the

mechanism through which institutional opening-up promotes high-quality corporate development; (3) Focusing on the heterogeneous effects of firm size, industry affiliation, and degree of marketization, identifying differences in innovation financing effects across firms with different characteristics in the cross-listing process, and offering more targeted practical references for category-based policy implementation to enhance corporate new quality productive forces.

The remainder of this paper is structured as follows: Section 2 presents theoretical analysis and research hypotheses; Section 3 describes the research design; Section 4 reports the empirical analysis; Section 5 presents mechanism analysis; Section 6 provides further analysis of the empirical results; Section 7 concludes with findings and implications.

2. Theoretical Analysis and Research Hypotheses

2.1. *The Impact of Cross-Listing on Corporate New Quality Productive Forces*

As the economy moves toward a stage of high-quality development, new quality productive forces—through the systematic upgrading of laborers, means of labor, and labor objects—have become key to enhancing corporate competitiveness. As a cross-market financing model, corporate cross-listing not only broadens funding sources but also directly affects the core elements of new quality productive forces: new-type laborers, new-type labor objects, and new-type means of labor. This paper analyzes how cross-listing influences corporate new quality productive forces by affecting the upgrading of these three elements.

At the level of new-type laborers, cross-listing entails deep participation in cross-border capital markets, which binds the firm to international regulatory standards and technical norms, thereby compelling the enterprise to build a composite human capital cultivation system. From the perspective of decision-makers, senior management teams gain overseas experience through practices such as international roadshows and cross-border investor relations management, shifting their strategic cognitive framework from a local perspective to a global resource allocation perspective. Moreover, stringent information disclosure requirements curb managerial self-interest and encourage management to focus on innovation in the firm's core business. This internalization of governance norms helps shape a strategic leadership team equipped with technological foresight and risk management capabilities [19]. At the execution level, in an increasingly competitive international environment, enterprises will intensify their efforts in talent cultivation, enhancing workers' skills and competencies to meet higher technical and managerial requirements, thereby providing a talent foundation for independent innovation [20]. Furthermore, by deeply embedding themselves in cross-border innovation collaboration networks, technical R&D personnel gain exposure to international cutting-edge technologies and management practices, driving a paradigm shift in knowledge production from isolated technological accumulation to open innovation networks. Overall, corporate cross-listing not only provides technical personnel with channels to absorb advanced experience but also, through the cross-border sharing of innovation resources, effectively shares the R&D costs and trial-and-error risks that would otherwise be borne by a single entity [21]. This process lays the foundation for independent innovation, prompting enterprises to more proactively increase investment in technology R&D during the cultivation of new quality productive forces, thereby accelerating the formation of innovation-driven development momentum.

At the level of new-type labor objects, cross-listing enables enterprises to break through geographical constraints, obtain higher-quality and scarcer raw materials and data resources [22], and expand the scope of labor objects, presenting the dual characteristics of breaking physical boundaries and restructuring digital space. At the same time, cross-listing also implies that enterprises integrate resources in larger capital markets. In this process, they can leverage the technology spillover effects generated by international advanced technologies, introduce intelligent production equipment and advanced process systems, optimize resource allocation mechanisms, reduce production costs, and simultaneously enhance the transformation efficiency and utilization precision of labor objects [18]; Furthermore, cross-listing may trigger "home bias" due to differences in cultural and institutional environments, leading investors to prefer investing in local companies. To address this, cross-listed enterprises are forced to build reputational capital through their ESG performance—by conveying positive

signals on environmental responsibility, social responsibility, and corporate governance to stakeholders, they can obtain government support, investor trust, and public recognition, thereby expanding external financing channels and enhancing competitiveness [23]. Under the pressure of international capital market regulation, enterprises are driven to shift their labor objects toward sustainable fields such as clean energy and digital materials, thereby promoting the optimization of corporate labor objects.

At the level of new-type means of labor, cross-listing expands the scope of capital trading markets for enterprises, broadens financing channels, and reduces financing costs [23]. This enables firms to increase investment in advanced production equipment, digital infrastructure, and R&D innovation, driving the upgrading of means of labor toward intelligent, automated, and green directions, and achieving a strategic capital leap. Furthermore, the participation of international capital makes enterprises more focused on long-term development and the enhancement of core competitiveness, incentivizing them to increase investment in key areas. At the same time, through international joint R&D and technology introduction, enterprises catalyze technological progress and transformation and upgrading, thereby increasing the technological content and added value of means of labor and helping enhance corporate new quality productive forces [24].

To summarize, cross-listing has a positive promoting effect on all three constituent elements of new quality productive forces—new-type laborers, new-type labor objects, and new-type means of labor. Therefore, this paper proposes Hypothesis H1:

H1: *Cross-listing has a significant positive promoting effect on the enhancement of new quality productive forces.*

2.2. The Mechanism of the Impact of Cross-Listing on New Quality Productive Forces

The core of developing new quality productive forces lies in original and disruptive technological innovation; the development of new quality productive forces is inseparable from the investment of innovation capital [25]. Among these, corporate innovation funding primarily comes from external financing, including equity financing, debt financing, and government subsidies. Enterprises with a higher proportion of equity financing have stronger incentives to increase their innovation investment expenditures [26]. Furthermore, technological innovation often entails high risks and uncertainties, requiring long-term and stable financial support [27], which presents a structural contradiction with traditional financing models. Cross-listing, in turn, can establish diversified financing channels, improve the level of corporate innovation financing, help enterprises break through innovation financing constraints, and thereby promote the enhancement of new quality productive forces.

Cross-listing can improve a firm's level of innovation financing, specifically in three dimensions: expanding the scale of innovation financing, diversifying innovation financing risks, and optimizing innovation financing costs.

First, in terms of the scale of innovation financing, the Market Segmentation Hypothesis suggests that obstacles such as transaction costs, information costs, and legal restrictions lead to market segmentation. Cross-listing can reduce the degree of capital market segmentation, improve stock liquidity, and enhance the quality of information disclosure. By broadening equity financing channels and increasing financing scale [28], cross-listing meets the company's capital needs [29], and enables it to increase R&D investment. From the perspective of China's actual situation, the venture capital market is still immature, the supply of direct financing is insufficient, and the social credit system needs further improvement, leaving considerable room for optimizing the innovation financing structure. Cross-listing, by leveraging mature capital markets—where the value and risks of corporate innovation can be discovered and priced through market mechanisms [6], which enables cross-listed firms to obtain more abundant patient capital. This expansion effect of capital supply is particularly significant for asset-light high-tech enterprises.

Second, in terms of innovation financing risk, by cross-listing in multiple capital markets, enterprises not only broaden their sources of innovation financing and diversify the financing risks associated with a single market but also secure stable financial support for continuous R&D investment [30]. From the perspective of the risk diversification mechanism, a market environment with a high degree of investor protection can attract more

investors, encouraging them to diversify innovation risks through portfolio allocation. At the same time, it creates a pattern in which multiple entities share the risk of innovation failure [31], thereby increasing the fault tolerance space for corporate innovation decisions and reducing the risk of the company falling into financial distress. The involvement of investors from different capital markets further strengthens this mechanism, as their diversified investment strategies enhance tolerance for the risk of innovation failure and effectively mitigate the impact of innovation uncertainty on a single financing channel [9]. More importantly, cross-listed firms are “bound” to developed capital markets, where the dual effects of mandatory disclosure systems and risk transfer mechanisms significantly reduce the degree of information asymmetry between investors and the firm. This process not only weakens the perceived intensity of innovation risks among investors but also lowers the firm’s financing costs by compressing the innovation risk premium, thereby providing more cost-effective innovation funding support for the enterprise [32].

Third, in terms of innovation financing costs, according to the Bonding Hypothesis, cross-listed firms, under stringent information disclosure requirements, “bind” themselves to the more robust governance mechanisms of developed capital markets [33], thereby improving their information environment and reducing information asymmetry risks [34]. Meanwhile, cross-listing can send a signal to the market that the firm is of high quality, thereby reducing its cost of equity financing [35]. By “bonding” to a market with higher investor protection standards, the firm reduces its agency costs [36] and enhances its market valuation.

Based on the above analysis, cross-listed firms improve their level of innovation financing in three aspects—scale, risk, and cost—thereby providing stable capital support and institutional guarantees for technological innovation, and becoming a key driving force for enhancing new quality productive forces. Therefore, this paper proposes Hypothesis H2:

H2: *Cross-listing promotes the development of new quality productive forces by improving the level of corporate innovation financing.*

3. Research Design

3.1. Model Specification

To examine the impact of cross-listing on corporate new quality productive forces, this paper constructs a regression model of the following form:

$$Np_{i,t} = \alpha_0 + \alpha_1 Cross_{i,t} + \sum_j \alpha_j Controls_{j,i,t} + \eta_{ind} + \eta_{year} + \varepsilon_{i,t} \quad (I)$$

In the first model, Np represents corporate new quality productive forces, $Cross$ is the core explanatory variable indicating whether a Chinese enterprise is cross-listed, $Controls$ denote control variables, η_{ind} and η_{year} represent industry fixed effects and year fixed effects, $\varepsilon_{i,t}$ is the random error term, i indexes the firms involved in this study, and t denotes time, $t = 2015, 2016, 2017, \dots, 2023$.

3.2. Variable Description

(1) Dependent Variable: New Quality Productive Forces (Np)

Based on the foregoing theoretical analysis, new quality productive forces exist by virtue of new-type laborers, new-type labor objects, and new-type means of labor. Accordingly, starting from the essential connotation of new quality productive forces, this paper draws on the approaches of refs. [18, 37–39]. An indicator system for measuring corporate new quality productive forces is constructed from three dimensions: new-type laborers, new-type labor objects, and new-type means of labor. The selection of indicators is shown in Table 1. This paper uses the entropy method to measure the level of corporate new quality productive forces.

Table 1. Evaluation Indicator System for New Quality Productive Forces.

Primary Indicator	Secondary Indicator	Tertiary Indicator	Indicator Description
New-type Laborers	Laborer Quality	Overseas background of executives	Whether the executive team has an overseas background
		Proportion of highly educated personnel	Number of employees with a bachelor's degree or above/Total number of employees
	Laborer Structure	Share of R&D staff salary	R&D expenses – salary and wages/Operating revenue
		Proportion of R&D personnel	Number of R&D personnel/Total number of employees
New-type Labor Objects	Production Labor Objects	Proportion of fixed assets	Fixed assets/Total assets
		Share of manufacturing expenses	(Cash outflow + Depreciation of fixed assets + Amortization of intangible assets + Impairment provisions – Labor payments – Employee wages)/(Cash outflow + Depreciation of fixed assets + Amortization of intangible assets + Impairment provisions)
	Natural Labor Objects	Corporate social responsibility	Huazheng ESG environmental score
		Corporate environmental protection	Total corporate environmental protection investment/Total assets
New-type Means of Labor	Hard Technology	Proportion of R&D depreciation and amortization	R&D expenses – depreciation and amortization/Operating revenue
		Proportion of R&D lease expenses	R&D expenses – lease expenses/Operating revenue
		Proportion of direct R&D investment	R&D expenses – direct investment/Operating revenue
		Proportion of intangible assets	Intangible assets/Total assets
	Soft Technology	Total asset turnover ratio	Operating revenue/Average total assets
		Reciprocal of equity multiplier	Owner's equity/Total assets

(2) Core explanatory variable: Cross-listing (*Cross*)

If a company achieves A+H share cross-listing during the sample study period, it is recorded as $Cross = 1$; otherwise, if the company does not undertake cross-listing, it is recorded as $Cross = 0$.

(3) Control Variables

Drawing on the relevant research on cross-listing by refs. [40,41], this paper controls for variables such as corporate financial conditions, industry characteristics, and macroeconomic factors that may affect corporate new quality productive forces.

Industry competition (*HHI*): measured by the Herfindahl–Hirschman Index of the industry to which the enterprise belongs, calculated based on operating revenue.

Regional economic level (*GDP*): measured by the natural logarithm of the annual GDP of the administrative region where the enterprise is located.

Free cash flow (*Cash*): measured by the ratio of the enterprise's free cash flow to total assets at the end of

the period.

Growth: measured by the growth rate of operating revenue.

Liquidity ratio (*Liq*): measured by the ratio of current liabilities to current assets at the end of the period.

Leverage ratio (*Lev*): measured by the ratio of total liabilities to total assets at the end of the period.

Return on total assets (*ROA*): measured by the ratio of net profit to the average balance of total assets at the end of the period.

Firm age (*Age*): measured by the natural logarithm of the number of years the enterprise has been in existence from its establishment to 2023.

This paper also controls for the effects of *year* and industry (*Ind*).

3.3. Data Sources

This paper takes Chinese A-share listed companies from 2015 to 2023 as the research object. The sample excludes poorly performing ST and *ST companies, financial enterprises, firms with abnormal financial data, and those with missing data. All continuous variables are winsorized at the 1st and 99th percentiles. The final sample consists of 18,437 observations. The data are mainly obtained from the CSMAR database, CNRDS database, and Wind database. The descriptive statistics of the main variables involved in this paper are shown in Table 2. Among them, the dependent variable, new quality productive force (*Np*), has a mean of 3.865 and a standard deviation of 3.805, with a minimum of 0.562 and a maximum of 34.10, indicating significant differences in the level of new quality productive forces among enterprises, which lays the foundation for the subsequent analysis. Similarly, all variables meet the requirements.

Table 2. Descriptive Statistics Results.

Variable	Obs	Mean	Std. Dev.	Min	Max
<i>Cross</i>	18,437	0.0423	0.201	0	1
<i>Np</i>	18,437	3.865	3.805	0.562	34.10
<i>HHI</i>	18,437	0.0946	0.0964	0.0225	0.680
<i>GDP</i>	18,437	60617	35677	2912	135673
<i>Csah</i>	18,437	0.0122	0.0873	-0.403	0.318
<i>Growth</i>	18,437	0.178	0.380	-0.542	3.541
<i>Liq</i>	18,437	2.413	2.156	0.246	17.06
<i>Lev</i>	18,437	0.406	0.186	0.0545	0.865
<i>Roa</i>	18,437	0.0559	0.0461	0.000383	0.290
<i>Age</i>	18,437	3.136	0.251	2.079	3.664

4. Empirical Analysis

4.1. Baseline Regression

Using the sample of Chinese A-share listed companies from 2015 to 2023 as described in this paper, the regression of Model (I) is conducted, and the regression results of the impact of cross-listing on corporate new quality productive forces are presented in Table 3.

The regression results in Table 3 show that in models (1) and (2), which do not include control variables, the estimated coefficients of the core explanatory variable are significantly positive at the 1% statistical level, preliminarily indicating a positive correlation between cross-listing and corporate new quality productive forces. However, given that control variables are not included in the model, these baseline results may be subject to a risk of spurious regression. In models (3) and (4), which incorporate the full set of control variables, the coefficient estimates and their statistical significance remain stable without significant changes. This robustness feature, to some extent, supports the relatively good exogeneity of the core explanatory variable (i.e., cross-

listing) in this paper. Taken together, the empirical evidence indicates that cross-listing has a positive promoting effect on the enhancement of corporate new quality productive forces, thus supporting Hypothesis H1.

Table 3. Baseline Regression Results.

Variable	(1)	(2)	(3)	(4)
<i>Cross</i>	2.0552 *** (0.139)	2.2924 *** (0.137)	2.2773 *** (0.139)	2.2996 *** (0.138)
<i>GDP</i>			0.0000 *** (0.000)	0.0000 *** (0.000)
<i>HHI</i>			0.1568 (0.279)	-0.7815 (0.910)
<i>Csah</i>			0.1184 (0.314)	0.3352 (0.309)
<i>Growth</i>			0.2579 *** (0.073)	0.2335 *** (0.072)
<i>Liq</i>			0.0772 *** (0.018)	0.0366 ** (0.018)
<i>Lev</i>			-0.1154 (0.205)	0.4118 * (0.218)
<i>Roa</i>			2.5466 *** (0.691)	2.5592 *** (0.707)
<i>Age</i>			-1.4366 *** (0.117)	-0.9858 *** (0.117)
<i>Constant</i>	3.7779 *** (0.028)	3.7678 *** (0.028)	7.3926 *** (0.400)	6.2613 *** (0.405)
Observations	18,437	18,437	18,437	18,437
R-squared	0.012	0.072	0.037	0.079
Ind FE	NO	YES	NO	YES
Year FE	NO	YES	NO	YES
r2_within	0.0118	0.0145	0.0370	0.0222
F	217.9	279.4	75.00	46.48

Standard errors in parentheses; * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

4.2. Robustness Tests

(1) Propensity Score Matching (PSM)

In view of the potential selection bias existing in the research, this paper adopts the propensity score matching (PSM) method to conduct robustness tests. In accordance with the Notice on Issues Concerning Enterprises' Applications for Overseas Listing issued by the China Securities Regulatory Commission in 1999, enterprises applying for overseas listing shall meet the following requirements: net assets of no less than 400 million RMB, after-tax profits of no less than 60 million RMB in the previous fiscal year, and a fundraising scale of no less than 50 million US dollars calculated based on a reasonably expected price-earnings ratio. Drawing on the research designs of refs. [9,12,42], this paper uses the cross-listing dummy variable (*Cross-listing*) as the dependent variable, and sets the natural logarithm of the company's net assets (*Equity*), the natural logarithm of net profit (*Netprofit*), and the price-to-earnings ratio (*PE*) as the core variables for PSM matching. It also controls for firm governance and financial factors, including the shareholding ratio of the largest shareholder (*Top1*), leverage ratio (*Lev*), property rights nature (*Soe*), the ratio of free cash flow to year-end total assets (*Cash*), and includes industry (*Ind*) and year (*Year*) fixed effects. The matching process adopts the 1:1 nearest neighbor matching principle with replacement, finally obtaining 1229 matched sample

observations, of which 693 are in the cross-listing group ($Cross = 1$) and 537 are in the non-cross-listing group ($Cross = 0$). The regression results after matching are shown in Table 4.

(2) Replacement of the Dependent Variable

Through innovative breakthroughs in new-type laborers, new-type means of labor, new-type labor objects, and their combinations, new quality productive forces achieve a significant increase in total factor productivity (TFP) [43]. In light of this, this study follows the research method of ref. [37] and selects total factor productivity (TFP) as a proxy variable for the level of corporate new quality productive forces. Regarding the measurement method, drawing on the research design of ref. [44], the LP method is adopted to quantitatively measure corporate total factor productivity (TFP_{LP}). The regression results after replacing the explanatory variable are shown in Table 4.

(3) Entropy Balancing Matching Method

To mitigate the impact of sample self-selection bias, this section draws on the research of refs. [45,46] and employs the Entropy Balancing Method (EBM) to conduct robustness tests on the aforementioned regression results. The specific procedure is as follows: (1) The sample is divided into groups, with cross-listed firms set as the treatment group ($Treat = 1$) and A-share listed firms as the control group ($Treat = 0$), using the control variables from the original model as covariates; (2) The first, second, and third moments of the covariates in the treatment and control groups are adjusted to achieve exact matching under different moment constraints; (3) The weighted and balanced sample is re-tested, and the regression results are shown in Table 4.

Table 4. Robustness Test Results (1).

Variable	Propensity Score Matching (PSM)		Replacement of the Dependent Variable		Entropy Balancing Method (EBM)	
	(1)	(2)	(3)	(4)	(5)	(6)
	Np	Np	Np	TFP_{LP}	Np	Np
<i>Cross</i>	2.4155 *** (0.224)	2.3992 *** (0.226)	2.2996 *** (0.138)	0.9509 *** (0.035)	2.2266 *** (0.145)	2.2149 *** (0.144)
<i>Constant</i>	3.5846 *** (0.154)	2.1137 (1.625)	6.2613 *** (0.405)	6.2190 *** (0.084)	3.5395 *** (0.047)	5.2951 *** (0.887)
Observations	1,230	1,230	18,437	18,437	18,437	18,437
R-squared	0.227	0.236	0.079	0.463	0.200	0.209
Controls FE	NO	YES	YES	YES	NO	YES
Ind FE	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES
r2_within	0.0925	0.104	0.0222	0.338	0.0759	0.0866
F	115.9	16.17	46.48	767.4	236.3	34.10

Standard errors in parentheses; * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

The robustness test results in Table 4 show that the core explanatory variable, cross-listing ($Cross$), passes the statistical significance test at the 1% level in models (1)–(6), and the coefficient sign is positive. This indicates that after the robustness tests using propensity score matching, replacement of the dependent variable, and entropy balancing matching, the conclusion regarding the impact of cross-listing on corporate new quality productive forces remains robust.

(4) Adding Control Variables and Adding Fixed Effects

To further control for the potential impact of omitted variable bias on the estimation results, this section, on

the basis of controlling for variables such as corporate financial conditions, industry characteristics, and macroeconomic factors that may affect corporate new quality productive forces, additionally controls for relevant corporate governance variables. Specifically, it includes three corporate governance variables: the shareholding ratio of the largest shareholder (*Top1*), CEO duality (*Dual*), and the proportion of independent directors (*IDR*). The regression results after adding these control variables are shown in Table 5. To further consider the impact of the empirical model estimation method on the baseline results and to control for potential interference from time-invariant unobserved heterogeneity at the regional level, province fixed effects are introduced into Model (1) [47]. Considering that regional differences may exhibit more nuanced heterogeneity at the city level, the study further incorporates city fixed effects to capture the idiosyncratic influences of micro-geographic units. The regression results after adding these fixed effects are shown in Table 5.

Table 5. Robustness Test Results (2).

Adding Control Variables			Adding Fixed Effects		
Variable	(1)	(2)	Variable	(3)	(4)
<i>Cross</i>	2.2996 *** (0.138)	2.3696 *** (0.137)	<i>Cross</i>	2.1075 *** (0.141)	1.9908 *** (0.145)
Control variables	Controlled	Controlled	Control variables	Controlled	Controlled
<i>Top1</i>		-0.0108 *** (0.002)	<i>Constant</i>	6.8001 *** (0.483)	6.8894 *** (0.497)
<i>Dual</i>		0.3804 *** (0.066)	Observations	18,437	18,421
<i>IDR</i>		-0.0084 * (0.005)	R-squared	0.092	0.139
<i>Constant</i>	6.2613 *** (0.405)	6.7184 *** (0.467)	Controls FE	YES	YES
Observations	18,437	18,437	Ind FE	YES	YES
R-squared	0.079	0.082	Year FE	YES	YES
Ind FE	YES	YES	Provincecode FE	YES	NO
Year FE	YES	YES	CityCode FE	NO	YES
r2_within	0.0222	0.0259	r2_within	0.0185	0.0172
F	46.48	40.94	F	38.55	34.48

Standard errors in parentheses; * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

The regression results in Table 5 show that the core explanatory variable, cross-listing (*Cross*), in Model (2) passes the significance test at the 1% level, and the coefficient sign is positive, indicating that cross-listing has a positive promoting effect on the enhancement of corporate new quality productive forces. Models (3) and (4) present the regression results after further controlling for provincial fixed effects and city fixed effects. The regression results show that in Models (3) and (4), the core explanatory variable, cross-listing (*Cross*), also passes the statistical significance test at the 1% level, i.e., cross-listing has a positive impact on improving the level of corporate new quality productive forces. Overall, after adding control variables and fixed effects, the research conclusions remain highly robust.

4.3. Heterogeneity Analysis

To more accurately grasp the impact of cross-listing on corporate new quality productive forces, this section further explores the heterogeneity of the impact from three dimensions: firm size, industry affiliation, and degree of marketization.

(1) Firm Size Heterogeneity Test. In this section, total assets are used to represent firm size. The median total assets of firms are calculated by year and by industry. Firms with total assets above the industry median are

classified as large-scale enterprises, and those below are classified as small-scale enterprises. Using this criterion, Model (I) is regressed. The regression results for the impact of cross-listing on new quality productive forces in small-scale and large-scale enterprises are shown in Models (1) and (2) of Table 6.

(2) Industry Heterogeneity Test. According to “the Classification of High-tech Industries (Manufacturing) (2017)” issued by the National Bureau of Statistics and “the Guidelines for Industry Classification of Listed Companies (2012 Revision)” issued by the China Securities Regulatory Commission, and following the approach of ref. [48], the sample enterprises are divided into high-tech enterprises and non-high-tech enterprises. The regression results for the impact of cross-listing on new quality productive forces are shown in Models (3) and (4) of Table 6.

(3) Marketization Degree Heterogeneity Test. Referring to “the China Sub-provincial Marketization Index Report”, the comprehensive marketization index is measured. Then, using the median as the threshold, the full sample is divided into high marketization degree group and low marketization degree group before regression. The regression results for the impact of cross-listing on new quality productive forces in regions with high and low degrees of marketization are shown in Models (5) and (6) of Table 6.

Table 6. Heterogeneity Analysis.

	(1)	(2)	(3)	(4)	(5)	(6)
Variable	Small-Scale Enterprises	Large-Scale Enterprises	Non-High-Tech Industries	High-Tech Industries	Low Marketization Degree	High Marketization Degree
<i>Cross</i>	1.3419 *** (0.376)	2.3725 *** (0.149)	2.1920 *** (0.151)	2.7062 *** (0.349)	1.8971 *** (0.499)	2.3056 *** (0.145)
<i>Constant</i>	7.1432 *** (0.603)	5.8813 *** (0.561)	6.0659 *** (0.505)	6.7928 *** (0.684)	6.2262 *** (1.063)	6.2852 *** (0.443)
Observations	9,215	9,217	12,210	6,219	2,744	15,690
R-squared	0.071	0.107	0.088	0.059	0.142	0.075
Controls FE	YES	YES	YES	YES	YES	YES
Ind FE	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES
r2_within	0.0153	0.0377	0.0237	0.0259	0.0198	0.0208
F	14.73	36.75	32.54	17.37	4.351	39.76
Coefficient of inter-group difference	-1.031 ***		0.273 *		-0.409 *	

Standard errors in parentheses; * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

The regression results in Table 6 show that in Models (1) and (2), the core explanatory variable, cross-listing (*Cross*), passes the statistical significance test at the 1% level. That is, cross-listing in both small-scale and large-scale enterprises helps promote the improvement of new quality productive forces. Comparing the coefficients of the core explanatory variable (*Cross*) between the two groups, the promoting effect of cross-listing on new quality productive forces is more pronounced in large-scale enterprises. The reason is that large-scale enterprises possess stronger and more stable R&D capabilities as a foundation. After cross-listing further broadens their financing channels, external funds, driven by risk aversion and return expectations, will preferentially flow to large-scale enterprises with more solid R&D capabilities [49], thereby providing a material foundation for enhancing their new quality productive forces. On the other hand, large-scale enterprises, by virtue of their strong capital strength and diversified business structures, possess greater risk resistance and innovation fault tolerance [50], which enables them to increase R&D investment in breakthrough innovation activities [51]. Breakthrough innovation, in turn, plays a key driving role in the leapfrog development of new quality

productive forces [52]. In contrast, constrained by resource endowments and weaker risk resistance, small-scale enterprises often strategically choose incremental innovation paths that are less risky and yield faster results [53]; their investment in breakthrough innovation is relatively cautious. However, the marginal contribution of incremental innovation to the development of new quality productive forces is generally not significant [54], which further widens the gap between the two types of enterprises in terms of the promoting effect of cross-listing on new quality productive forces.

In Models (3) and (4), the core explanatory variable, cross-listing (Cross), also passes the statistical significance test at the 1% level, and the coefficient in Model (4) is significantly larger than that in Model (3), indicating that cross-listing in both non-high-tech and high-tech enterprises promotes the enhancement of corporate new quality productive forces, with a more pronounced effect in high-tech enterprises. The reason is that high-tech enterprises are inherently at the forefront of technological innovation and have more urgent needs for high-end factors such as capital, technology, and talent [55]. Cross-listing helps them gather innovation resources in broader capital markets, create a better environment for property rights protection [56], and accelerate technology R&D and transformation, thereby enhancing the level of new quality productive forces to a greater extent.

The regression results in Models (5) and (6) show that for enterprises in both high-marketization and low-marketization regions, cross-listing behavior helps improve their level of new quality productive forces, and the promoting effect of cross-listing on new quality productive forces is greater for enterprises in regions with a high degree of marketization. The reason is that regions with a high degree of marketization have more intense industry competition and less government intervention, which provides a more favorable environment for corporate external financing and innovation investment [18]. Under such circumstances, cross-listed enterprises can more efficiently align with international capital market rules, absorb advanced management experience and technologies, thereby further attracting external financing, activating innovation vitality [41], and enhancing new quality productive forces.

In addition, this section further tests the inter-group coefficient differences using Fisher's permutation test following the approach of ref. [57]. Based on the Bootstrap method with 500 replications, the p -values of the inter-group coefficient difference tests are all significant below the 10% level, indicating that the impact of cross-listing on corporate new quality productive forces differs significantly between large-scale and small-scale enterprises, between high-tech and non-high-tech enterprises, and between enterprises in high-marketization and low-marketization regions.

5. Mechanism Analysis

5.1. Model Specification

To test whether cross-listing affects new quality productive forces by improving the level of corporate innovation financing, this paper draws on the study of ref. [58] and, based on the baseline Model (I), constructs the following mediation effect model to test whether Hypothesis H2 holds. The model is specified as follows:

$$ITLOF_{i,t} = \beta_0 + \beta_1 Cross_{i,t} + \sum_j \delta_j Controls_{j,i,t} + \eta_{ind} + \eta_{year} + \varepsilon_{i,t} \quad (II)$$

In Model (II), ITLOF represents the mechanism variable, i.e., the level of innovation financing (Innovate the level of financing, ITLOF). The meanings of the other variables remain consistent with those in the baseline regression Model (I). Following the approach of ref. [58], this paper considers that the conditions for a mediation effect to hold are that both the regression coefficient β_1 of the core explanatory variable (*Cross*) on the mediator variable (*ITLOF*) and the regression coefficient α_1 of the mediator variable (*ITLOF*) on the dependent variable (*Np*) are significant.

5.2. Measurement of Mechanism Variables

Compared with a single market, the obvious difference of cross-listing lies in the different financing environment. Moreover, since the innovation investment level of Chinese listed enterprises has not yet reached

the optimal state, firms are more inclined to rely on external financing channels to meet their innovation investment needs [26]. Therefore, the measurement of the level of innovation financing in this paper is mainly based on factors related to the external financing environment. This paper constructs the corporate innovation financing level indicator from three dimensions: financing cost, financing scale, and financing risk.

Among them, the scale of external financing includes three parts: equity financing scale, debt financing scale, and government subsidies. Equity financing has a strong risk-bearing capacity and can match innovation investment in terms of maturity and risk premium [26]. Under a main bank-oriented financial system, bank credit financing has stronger supervision effectiveness over the principal. By leveraging the advantages of financing market scale, it can promote technological innovation in low-risk fields, traditional mature industries, and capital-intensive sectors [59]. In addition, in technology R&D, government industrial innovation funds and science and technology innovation subsidies have become important sources of funding for corporate innovation investment. By continuously following up on corporate innovation projects, the government effectively alleviates information asymmetry, reduces innovation investment risks, and mitigates market failures [60,61]. This paper follows the approach of ref. [26] and measures equity financing by the ratio of cash received from equity investments to total assets at the beginning of the period, debt financing by the ratio of cash received from borrowings to total assets at the beginning of the period, and government subsidies by the ratio of government subsidies disclosed in the annual reports of listed companies to total assets at the beginning of the period.

In addition, external financing for enterprises is mainly achieved through debt and equity financing, which have different risk characteristics due to differences in their liquidation logic. Among them, debt financing primarily involves the rigid obligation to repay principal and interest upon maturity, which exposes the firm to the risk of financial distress [62]; The stock price crash risk of equity financing stems from agency problems and information asymmetry. When negative information accumulates and erupts centrally, it can trigger a sharp drop in stock prices and a crisis for the company's survival [45, 63, 64]. These two types of risks correspond respectively to the "rigid repayment pressure" of debt financing and the "agency conflicts and hidden dangers of information asymmetry" of equity financing, constituting the core risk categories of corporate external financing. Therefore, following the classification of financing risks by ref. [65], this paper divides financing risks into financial distress risk and stock price crash risk. Financial distress risk is measured by the Z-score index proposed by ref. [62], and stock price crash risk is measured by the negative skewness of annual returns [64].

At the same time, the costs incurred in external financing can be divided into debt financing costs and equity financing costs. Following the approaches of refs. [66,67], this paper measures corporate debt financing costs by the ratio of interest expenses to the difference between total liabilities and accounts payable, and measures corporate equity financing costs by the cost of equity capital estimated using the PEG model based on the price-earnings ratio.

Based on the above analysis, this paper selects seven secondary indicators from three dimensions—financing cost, financing scale, and financing risk—and uses the entropy method to measure the level of corporate innovation financing. The selection of indicators is shown in Table 7.

5.3. Mechanism Test Results

Following the approach of ref. [58], using the level of innovation financing as the mediating variable, the mechanism test results of the impact of cross-listing on corporate new quality productive forces are shown in Table 8.

The regression results in Table 8 show that in Models (1) and (2), the core explanatory variable, cross-listing (*Cross*), passes the significance test at the 1% level in both models, and the coefficients are positive. This finding satisfies the conditions for a mediation effect, and therefore it is concluded that cross-listing can promote the enhancement of new quality productive forces by improving the level of corporate innovation financing—that is, Hypothesis H2 holds.

Table 7. Measurement Indicators of Corporate Innovation Financing Level.

Primary Indicator	Secondary Indicator	Indicator Description
Financing Scale	Debt financing scale	External borrowings/Total assets
	Equity financing scale	Cash received from equity investments/Total assets
	Government subsidies	Government subsidies/Total assets
Financing Risk	Financial distress risk	Z-score index
	Stock price crash risk	Negative skewness of returns
Financing Cost	Debt financing cost	Ratio of interest expenses to (total liabilities–accounts payable)
	Equity financing cost	Cost of equity capital estimated using the PEG model based on the price-earnings ratio

Table 8. Mediation Effect Test Results.

Variable	(1)	(2)
	<i>Np</i>	<i>ITLOF</i>
<i>Cross</i>	2.2996 *** (0.138)	0.0139 *** (0.002)
<i>Constant</i>	6.2613 *** (0.405)	0.1328 *** (0.009)
Observations	18,437	18,437
R-squared	0.079	0.232
Controls FE	YES	YES
Ind FE	YES	YES
Year FE	YES	YES
r2_within	0.0222	0.128
F	46.48	300.1

Standard errors in parentheses; * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

On this basis, this paper further employs the bootstrap method with 1000 replications to test whether the mediation effect exists; the results are shown in Table 9.

Table 9. Bootstrap Test Results of the Model.

Variable	Effect Type	Observed Coefficient	Bias	Standard Error	95% Confidence Interval
level of innovation financing	Indirect effect	0.02111741	0.00000806	0.00712152	[0.0080261, 0.0350385] (P)
					[0.0088802, 0.0365993] (BC)
	Direct effect	2.2561612	−0.0020597	0.13792356	[1.983296, 2.522218] (P)
					[1.986803, 2.543097] (BC)

P refers to percentile, BC refers to bias-corrected.

The test results in Table 9 show that the confidence intervals of the effect values of cross-listing affecting corporate new quality productive forces through improving the level of corporate innovation financing all exclude zero, indicating that the level of corporate innovation financing plays a significant mediating role.

6. Further Analysis

6.1. Test of the Persistence of the Impact Effect

The foregoing research shows that cross-listing has a significant promoting effect on the enhancement of corporate new quality productive forces. To further explore the temporal characteristics of this effect and determine whether it is short-term or long-term, this section regresses the cross-listing variable on the new quality productive forces indicators of the current period, one-period lag, two-period lag, and three-period lag, respectively, to test the persistence of the effect. The test results are shown in Table 10.

Table 10. Persistence of the Positive Effect.

Variable	(1)	(2)	(3)	(4)
	<i>Np</i>	<i>L1.Np</i>	<i>L2.Np</i>	<i>L3.Np</i>
<i>Cross</i>	2.2996 *** (0.138)	2.348 *** (0.150)	2.2833 *** (0.167)	2.2655 *** (0.185)
<i>Constant</i>	6.2613 *** (0.405)	5.6141 *** (0.438)	5.4797 *** (0.517)	5.3839 *** (0.611)
Observations	18,437	14,002	10,607	7958
R-squared	0.079	0.090	0.094	0.102
Controls FE	YES	YES	YES	YES
Ind FE	YES	YES	YES	YES
Year FE	YES	YES	YES	YES
r2_within	0.0222	0.0284	0.0316	0.0361
F	46.48	39.93	33.11	28.26

Standard errors in parentheses; * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 10 shows that in Models (1) through (4), the core explanatory variable, cross-listing (*Cross*), is statistically significant at the 1% level in all models, and the coefficient signs are positive. This finding indicates that the promoting effect of cross-listing on the enhancement of corporate new quality productive forces is not a short-term, policy-driven immediate response, but rather a sustained release of long-term institutional advantages—such as improved financing conditions and optimized governance mechanisms—that continuously empower corporate technological innovation and production efficiency.

6.2. The Impact of Corporate Cross-Listing Duration on New Quality Productive Forces

Based on the positive impact of cross-listing on the enhancement of corporate new quality productive forces, this section further investigates whether the duration of cross-listing has a dynamic effect on this impact. To this end, this section constructs a variable for the number of years of cross-listing (*AGE_H*), defined as the time interval from the year the company was listed on H-shares to the current year of the study (with a value of 0 before listing), in order to examine the cumulative effect of cross-listing duration on corporate new quality productive forces. The regression results are shown in Table 11.

The regression results in Table 11 show a significant positive correlation between the number of years of cross-listing and corporate new quality productive forces. As the number of years of cross-listing increases, the promoting effect of cross-listing on new quality productive forces shows a gradually strengthening trend. That is, enterprises that maintain cross-listing status over the long term can continuously benefit from the regulatory constraints and resource allocation advantages of overseas capital markets, forming an institutional accumulation in terms of corporate governance optimization, expansion of innovation financing channels, and improvement of technology conversion efficiency, thereby achieving a progressive enhancement of new quality productive forces.

Table 11. Regression Results of the Impact of Corporate Cross-listing Duration on New Quality Productive Forces.

Variable	(1)	(2)
<i>AGE_H</i>	0.1231 *** (0.011)	0.1289 *** (0.011)
<i>Constant</i>	3.8087 *** (0.027)	6.5096 *** (0.407)
Observations	18,437	18,437
R-squared	0.065	0.073
Controls FE	NO	YES
Ind FE	YES	YES
Year FE	YES	YES
r2_within	0.00789	0.0163
F	126.0	31.41

Standard errors in parentheses; * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

7. Conclusions and Implications

Based on the above analysis, the following conclusions can be drawn: First, cross-listing has a significant positive impact on corporate new quality productive forces, and this conclusion remains valid after robustness tests including variable replacement, endogeneity control, and multi-dimensional checks. Second, the level of innovation financing is a key mediating mechanism through which cross-listing affects new quality productive forces; cross-listing provides continuous capital support for corporate technological innovation. Third, heterogeneity analysis shows that the promoting effect of cross-listing on new quality productive forces is stronger for large-scale enterprises (due to stronger resource integration capabilities), for high-tech enterprises (due to more urgent technological needs), and for enterprises in regions with a high degree of marketization (due to better institutional adaptability). Fourth, the positive effect of cross-listing is long-term, and its promoting effect on new quality productive forces increases with the length of time listed. Based on the above analysis, this paper derives the following implications:

At the policy level, efforts should continue to deepen the two-way opening of capital markets, streamline cross-border listing approval procedures, and reduce corporate compliance costs, thereby enabling enterprises to access domestic and foreign financing channels. Specifically addressing the innovation needs of high-tech and capital-intensive enterprises, special cross-border financing support programs could be explored to strengthen the global allocation capacity of innovation factors such as technology and capital, and to overcome the financing constraints and governance limitations of traditional single markets. Enterprises need to precisely plan their cross-listing strategies according to their own size and industry characteristics. Large-scale, technology-intensive enterprises can give priority to leveraging the financing advantages and strict governance standards of overseas markets, directing cross-border capital toward core technology R&D and long-term innovation projects to amplify resource integration effects. Small- and medium-sized enterprises should focus on internal governance optimization and risk management capacity building, improving information disclosure and compliance levels to lay an institutional foundation for accessing cross-border capital markets, thereby gradually unlocking the potential of cross-listing. Regulatory authorities should strengthen the coordination of cross-border information disclosure standards and investor protection mechanisms, promote deep alignment of domestic and foreign regulatory rules, and reduce information asymmetry risks in cross-border financing. Meanwhile, a “regulatory sandbox” mechanism could be explored: for small- and medium-sized technology enterprises with high R&D intensity and strong technology transformation potential, new types of cross-border financing instruments (e.g., bonds backed by future income rights of patent portfolios) could be piloted within a controlled environment, allowing them to accumulate innovation financing experience under risk isolation and

reduce information asymmetry risks. At the same time, a dynamic evaluation system should be established to continuously monitor the long-term impact of cross-listing on corporate innovation input, technology transformation, and productivity enhancement, ensuring that the dividends of institutional opening are effectively transmitted to the cultivation of new quality productive forces, thereby forming a synergistic development pattern of “policy guidance–enterprise practice–regulatory support.”

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