ISSN: 2710-0588

How Does Artificial Intelligence Empower the Development of New-Quality Productivity?

-- Based on the Policy Effects of the Pilot Zones for Innovation and Development of the New Generation of Artificial Intelligence

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Abstract

In the current era where a new round of technological revolution and industrial transformation is intertwined, leveraging artificial intelligence to empower the cultivation of new-quality productivity has become a core path for driving development. This paper focuses on the policy of the New Generation Artificial Intelligence Innovation and Development Pilot Zones, selecting panel data from 30 provinces in China from 2012 to 2022 as the analysis sample. It employs a multi-period difference-in-differences model and, in combination with the CRITIC entropy weighting method, constructs a comprehensive evaluation system for new-quality productivity covering labor, labor resources, labor objects, and factor combination efficiency to empirically test the policy effects of the pilot zones. The study finds that the pilot zone policy significantly promotes the enhancement of new-quality productivity, and this effect remains robust after a series of robustness checks such as the parallel trends test and placebo test. Mediation effect tests indicate that industrial structure upgrading and talent aggregation are important transmission paths through which the pilot zone policy empowers new-quality productivity. Heterogeneity analysis shows that the policy effect exhibits significant regional differences, being most pronounced in the eastern region, followed by the western region, while the impact in the central and northeastern regions is not statistically significant. Additionally, provinces with higher levels of openness and marketization gain more pronounced positive benefits from this policy. The research conclusions provide empirical evidence and practical reference for optimizing artificial intelligence development policies and promoting the cultivation of new-quality productivity.

Keywords

New Quality Productivity, Artificial Intelligence, New Generation Artificial Intelligence Innovation Development Pilot Zone, Policy Effect.

1. Introduction

The current round of technological revolution and industrial transformation are deeply intertwined. Cultivating new productive forces represented by cutting-edge technologies such as artificial intelligence is the fundamental way to solve the changes in internal and external environments and achieve short-term economic recovery and breakthroughs in long-term international competition[1]. The policies of the new generation of artificial intelligence innovation and development pilot zones, as the core measures to promote the development of

ISSN: 2710-0588

artificial intelligence, promote the deep integration of artificial intelligence and the economy through technological demonstration and policy experimentation. As of 2022, China has established 18 pilot zones. Theoretically, artificial intelligence, as a key production factor, provides technical support for the cultivation of new productive forces through its permeability and synergy. New productive forces are essentially a qualitative change in productive forces driven by scientific and technological innovation, and are the innovative development of Marxist productivity theory in the digital era. Therefore, clarifying the policy effects of the pilot zone policies, their enhancing effect on new productive forces, and the internal mechanism, has important practical significance for exploring the development path of artificial intelligence, empowering the cultivation of new productive forces and achieving high-quality economic development.

The theoretical roots of new-type productive forces can be traced back to Marxist productivity theory, which emphasizes the transformative role of technological revolutions and factor allocation innovations on productivity.[2]

Currently, related theoretical research mainly unfolds from three aspects: connotation, characteristics, and significance. Gao Fan (2023) elaborates on the connotation of new quality productivity from multiple dimensions such as outcomes, elements, and combinations of elements, pointing out that the proposal of "new quality productivity" provides an important opportunity for China to promote high-quality development in practice and to accelerate the construction of the political economy of socialism with Chinese characteristics in theory [3]; Zhang Xiaheng et al. (2024) believe that new-type productivity is specifically reflected in the development trends of strategic emerging industries and future industries, with technological innovation, management innovation, and model innovation being its core essence [4]; Zhai Yun et al. (2024) examined the development trajectory and systemic impacts of new productive forces from the perspective of digital transformation by integrating relevant theoretical findings from the action structure mechanism theory and the functional structure mechanism theory [5]

As a new type of production factor, artificial intelligence has attracted considerable attention for its economic effects. Existing literature indicates that artificial intelligence can reduce production costs through 'intelligent automation [6], optimize resource allocation[7], and promote the improvement of total factor productivity through technology spillovers[8]. However, research on the productivity effects driven by policy is still lacking. Most studies are limited to the micro level of enterprises and lack dynamic assessments of macro policies. In addition, the interaction mechanisms between artificial intelligence and worker quality or industrial structure have not yet been fully revealed.[9]

However, current research still has several shortcomings: First, the theoretical mechanisms linking artificial intelligence and new-quality productive forces lack systematic elaboration and empirical validation. Second, evaluations of AI policy effects predominantly focus on localized regions or single industries, lacking nationwide, multi-temporal policy impact analysis. Third, measurement systems for new-quality productive forces remain inconsistent, with most studies neglecting the critical dimension of “factor combination efficiency,” making it difficult to comprehensively reflect qualitative leaps in productivity. To address these gaps, this paper employs a multi-period difference-in-differences model using panel data from 30 Chinese provinces spanning 2012–2022. Starting from the policy practice of “AI Innovation and Development Pilot Zones,” it empirically examines the impact and mechanism of AI on new-quality productivity.

ISSN: 2710-0588

2. Theoretical Analysis and Research Hypotheses

2.1. Direct Impact Mechanism of Pilot Zone Policies on the Development of New Quality Productivity

At present, the development of new quality productive forces in our country is constrained by the insufficient scale of new production factors and the low efficiency of their allocation. The policies of the new-generation artificial intelligence innovation development pilot zones provide an important path to solve this predicament. The core is to leverage the role of artificial intelligence as a new production factor, and through structural empowerment to promote the transformation of the productive system. Specifically, it manifests as: driving the improvement of labor quality through "substitution effect" and "matching effect", driving the evolution of labor materials towards digitalization and intelligence, expanding the scope of labor objects and giving rise to new business forms, while relying on technological empowerment and institutional pressure to optimize the efficiency of factor combination. The pilot zone policies promote the systematic growth and coordinated allocation of key factors through measures such as "artificial intelligence+" integration actions, infrastructure construction, and optimization of the institutional environment. This systematically injects continuous impetus into the development of new quality productive forces. Based on this, this paper proposes the following research hypotheses:

H1: The implementation of pilot zone policies can significantly promote the development of new-type productive forces.

2.2. Indirect Mechanisms of Pilot Zone Policies on the Development of New Quality Productivity

2.2.1. The Intermediary Effect of Industrial Structure Upgrading

From the perspective of industrial structure upgrading, artificial intelligence, with its strong pervasiveness and technological synergy capabilities, drives the transformation of industrial structures toward high-end, intelligent, and green development. On one hand, AI technologies are reshaping traditional production models, accelerating the evolution of industries toward technology-intensive sectors, and enabling high-efficiency output with low input, low consumption, and low pollution. On the other hand, artificial intelligence facilitates the cross-industry restructuring of production factors, strengthens industrial linkages and collaboration, and continuously incubates emerging industries and future business models through technological spillover and multiplier effects, thereby providing a solid industrial foundation for new productive forces. Based on these mechanisms, this paper proposes:

H2: Pilot zone policies can indirectly elevate the level of new-type productive forces by driving industrial structure upgrades.

2.2.2. The Intermediary Effect of Talent Aggregation

From the perspective of talent aggregation, the pilot zone's policies can create a “talent magnet” through institutional attraction, platform empowerment, and brand effect. At the institutional level, supporting incentive and safeguard policies provide talent with a competitive development environment. Economically, the “pilot zone” brand itself symbolizes innovation potential and economic vitality, helping to enhance talent's expected returns. Resource-wise, clustered R&D platforms and infrastructure offer high-level talent space to showcase their capabilities. These factors collectively drive the flow of high-end talent toward the pilot zone, forming a human capital hub that provides core intellectual support for the development of new productive forces. Based on this, this paper proposes:

H3: Pilot zone policies can indirectly elevate the level of new-type productive forces by promoting talent aggregation.

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3. Research Design

3.1. Model Specifications

This study treats pilot zone policies as a quasi-natural experiment and employs a double difference approach to examine their impact on the development level of new-type productive forces. However, since pilot zone policies were implemented in batches, this paper opts to construct a multi-date double difference model (MDID):

$$NP_{it} = \beta_0 + \beta_1 Treat_i \times Post_t + \beta X_{it} + \lambda_i + \mu_t + \varepsilon_{it} \tag{1}$$

In the formula, NP_{it} represents the level of new-type productive force， $Treat_i \times Post_t$ is the interaction term between the province dummy variable ($Treat_i$) and the time dummy variable ($Post_t$).Indicates whether province i was designated as an artificial intelligence innovation and development pilot zone in year t. X_{it} denotes a series of other control variables that may influence the level of new-type productive forces, λ_i represents province-specific fixed effects, μ_t is a time fixed effect, ε_{it} is a random disturbance term.

Meanwhile, based on the preceding theoretical analysis, pilot zone policies may exert intermediary effects such as industrial structure upgrading and talent aggregation, thereby indirectly influencing the development level of new-quality productive forces. To this end, the following model is constructed:

$$M_{it} = \alpha_0 + \alpha_1 Treat_i \times Post_t + \alpha X_{it} + \lambda_i + \mu_t + \varepsilon_{it} \tag{2}$$

$$NP_{it} = \gamma_0 + \gamma_1 Treat_i \times Post_t + \gamma_2 M_{it} + \gamma X_{it} + \lambda_i + \mu_t + \varepsilon_{it} \tag{3}$$

Here, M_{it} is the mediator variable, and the meanings of the other variables are the same as in Equation (1).

3.2. Variable Declaration

3.2.1. Dependent Variable

Based on an analysis of Marx's theory of productive forces and drawing upon the relevant research of Wang Jue and Wang Rongji[10]. This paper primarily constructs an evaluation index system for new-type productive forces from three dimensions: laborers, means of production, and objects of labor. However, with the continuous advancement of artificial intelligence, the level of new-type productive forces is not only reflected in the upgrading of production factors themselves but increasingly depends on the synergy and allocation efficiency among these factors. Therefore, this paper further draws upon the research of Ouyang Jinqiong [11]and others, introducing “factor combination efficiency” as the fourth primary indicator within the metric system. This addition aims to provide a more comprehensive and systematic reflection of the overall level and intrinsic structure of new-type productive forces.

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Table 1. Evaluation Indicator System for New Quality Productivity

Primary Indicators	Secondary Indicators	Tertiary Indicators	Indicator Explanations
Laborers	**Labor Production**	**Average Wage per Capita**	**Average wage of employed persons**
	Human Capital	**Higher Education Level**	**Proportion of college students in the total population**
	Entrepreneurial Capacity	**Entrepreneurial Activity**	**Number of newly established enterprises per 100 people**
	Employment Structure	**Non-agricultural Employment Proportion**	**Proportion of employees in the secondary and tertiary industries in total employment**
	Consumption Structure	**Consumption Structure Transformation**	**Engel's Coefficient**
Means of Labor	**Digital Infrastructure**	**Software Services**	**Software business revenue**
		Internet Development Level	**Number of broadband access ports per capita**
		Telecommunications Services	**Total telecommunications business volume**
		E-Commerce	**E-commerce sales volume**
	Energy Input	**Energy Utilization Efficiency**	**Gross Domestic Product (GDP) / Energy Consumption**
		Renewable Energy Input	**Renewable energy power consumption / Total social electricity consumption**
	Scientific and Technological Means	**Scientific and Technological Progress**	**Number of authorized patents / Total population**
		Enterprise Innovation Capacity	**Industrial innovation funds of industrial enterprises above designated size**
Objects of Labor	**New-Quality Industries**	**Future Industries**	**Robot installation density**
		Strategic Emerging Industries	**Number of enterprises in strategic emerging industries**
	Ecological Industries	**Forest Coverage Rate**	**Forest area / Land area**
		Environmental Protection Investment Intensity	**Environmental protection expenditure / Government public financial expenditure**
		Environmental Mechanism Intensity	**Completed investment in industrial pollution control**
Factor Combination Efficiency	**Comprehensive Efficiency**	**Total Factor Productivity (TFP)**	**Measured by Stochastic Frontier Analysis (SFA)**
	Investment Efficiency	**Investment-Output Ratio**	**Gross Domestic Product (GDP) / Government budget input**
	Institutional Efficiency	**Marketization Degree**	**Marketization Index**

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3.2.2. Core Explanatory Variable

The core explanatory variable in this study is the pilot policy variable. If a city is approved as an AI innovation and development pilot zone in year t, then the corresponding province receives a value of 1 for Treat×Post starting from that year; otherwise, it is 0. The Ministry of Science and Technology established pilot zones in three batches during 2019, 2020, and 2021. Considering potential implementation lags, for cities approved in September or later, this study adjusts the policy effective date to the following year to ensure more robust estimation results.

3.2.3. Mediating Variable

This study employs two mediating variables. Talent Agglomeration (TAG) is measured using the location entropy method to assess the concentration of full-time equivalent R&D personnel across provinces, following the methodology of Hu Jingwei and Guo Jinhua[12]. Industrial Structure (IS) is represented by the industrial structure upgrading coefficient, calculated specifically as the proportion of the tertiary sector in GDP.

3.2.4. Control Variables

(1) Education Investment (Edu): Measured by the proportion of education expenditure in fiscal spending, reflecting human capital investment across regions; (2) Financial Development Level (Fin): Characterized by the ratio of outstanding loans to GDP, indicating the financial system's support for the real economy and technological upgrading; (3) Industrialization Level (Ind): Assessed by the share of industrial value-added in GDP, reflecting regional industrialization progress and industrial structure characteristics; (4) Transportation Infrastructure Level (Infra): Expressed as the logarithm of per capita highway mileage, this indicates how well-developed infrastructure supports factor mobility and production activities; (5) Urbanization Rate (Urban): Represented by the proportion of urban population relative to the total resident population, this reflects population concentration and the stage of economic development.

3.3. Data Sources and Descriptive Statistics

3.3.1. Data Source

This study uses provincial and municipal data from China between 2012 and 2022 as its research sample. The data primarily originates from the China Statistical Yearbook, China Industrial Statistical Yearbook, provincial statistical yearbooks, and the EPS database for the corresponding years. For certain missing values, linear interpolation was employed to fill in the gaps.

3.3.2. Descriptive Statistics

Table 2. Descriptive statistics results

Variable	Sample Size	Mean	Standard Deviation	Minimum	Maximum
NP	**330**	**0.225**	**0.078**	**0.091**	**0.586**
Treat×Post	**330**	**0.124**	**0.330**	**0.000**	**1.000**
TAG	**330**	**0.983**	**0.925**	**0.145**	**5.031**
IS	**330**	**1.383**	**0.752**	**0.613**	**5.282**
Edu	**330**	**0.252**	**0.109**	**0.117**	**0.643**
Fin	**330**	**1.545**	**0.448**	**0.698**	**2.774**
Ind	**330**	**0.324**	**0.075**	**0.100**	**0.542**
Infra	**330**	**11.718**	**0.852**	**9.435**	**12.911**
Urban	**330**	**0.606**	**0.118**	**0.363**	**0.896**

Descriptive statistics are presented in Table 2, where the mean of New Quality Productivity (NP) is 0.225 with a standard deviation of 0.078. The minimum and maximum values are 0.091 and 0.586, respectively, indicating significant regional variation in this indicator and providing a necessary foundation for subsequent heterogeneity analysis. Concurrently, the pilot policy

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variable Treat×Post exhibits a mean of 0.124, indicating that approximately 12.4% of observations were subject to pilot zone policy effects during the 2012–2022 sample period.

4. Empirical Analysis

4.1. Baseline Regression Results

Table 3 presents the benchmark regression results for the impact of pilot zone policies on new-type productive forces. Column (1) shows estimates without control variables, while Column (2) presents estimates with control variables included. The results indicate that the coefficient for the core explanatory variable Treat×Post is significantly positive at the 1% level, confirming that pilot zone policies effectively promote the enhancement of new-type productive forces, thereby validating H1. In terms of estimated coefficients, after controlling for other factors, the new quality productivity in pilot regions is approximately 2.84% higher on average than in non-pilot regions.

Table 3. Baseline regression results

Variable	(1) NP	(2) NP
Treat×post	**0.0351***	**0.0284***
	(0.005)	**(0.005)**
Edu		**0.0603****
		(0.025)
Fin		**0.0195****
		(0.0087)
Ind		**-0.0668**
		(0.056)
Infra		**0.0475****
		(0.022)
Urban		**0.0557***
		(0.035)
Province Fixed	**Yes**	**Yes**
Time Fixed	**Yes**	**Yes**
Intercept Term	**0.2187*****	**0.8732*****
	(0.001)	**(0.235)**
Observed Variable	**330**	**330**
R^2	**0.958**	**0.963**

Note: Values in parentheses indicate standard deviation. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively. The same applies to the table below.

4.2. Parallel Trend Test

The reliability of the double difference model hinges on the parallel trend assumption, which posits that the treatment and control groups exhibit common trends prior to policy intervention. Following policy implementation, the treatment group experiences an exogenous shock from the policy, causing its level of new-type productivity to deviate from its original trend, while the control group remains unchanged. Based on this, the model is constructed as follows:

$$Np_{it} = \sum_{k \geq -5, k \neq -1}^{3} \mu_k D_{it}^k + \gamma X_{it} + u_i + u_t + \varepsilon_{it} \quad (4)$$

In the equation, the dummy variable D_{it}^{k} is set as the core variable for dynamic impact testing, where D_{it}^{k} represents the interaction term between the time dummy variable for year k (before or after policy implementation) and the policy variable. To avoid multicollinearity, this study treats the fifth year prior to the pilot policy implementation and earlier years uniformly as the -5th period preceding the pilot policy implementation. μ_k denotes the regression coefficient relative to the base year.

The results of the parallel trend test are shown in Figure 1. To avoid multicollinearity interference, the sample data from the year prior to policy implementation were specifically excluded. The results indicate that for all periods before policy implementation, the confidence intervals for the estimated coefficient μ_k included zero, suggesting no systematic difference in new-type productivity levels between the treatment and control groups. This satisfies the parallel trend assumption and supports the validity of the difference-in-differences model. Following policy implementation, the estimated value of μ_k turned positive and gradually increased, with its confidence interval consistently remaining above zero. This indicates that the pilot zone policy exerts a significant and increasing promotional effect on new-type productivity, with the effect gradually strengthening over time and exhibiting certain dynamic cumulative characteristics.

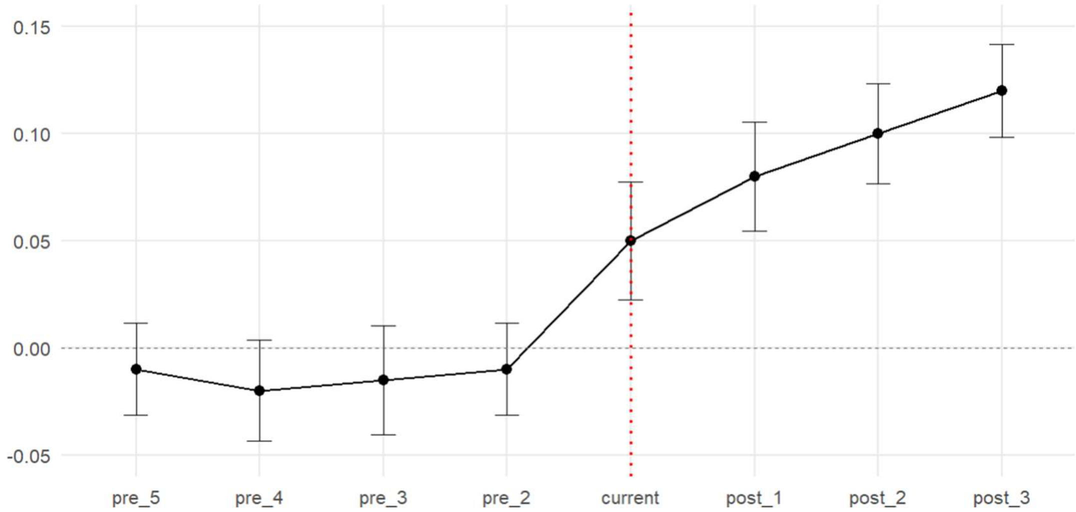

Figure 1. Parallel Trend Test Results

4.3. Robustness Test

4.3.1. Placebo Test

To further verify whether the impact of pilot zone policies on new-type productive forces is subject to bias caused by other unobservable factors, this study conducts a randomized placebo test. The sample undergoes 500 random draws, estimated using a benchmark regression model. Results are shown in Figure 2. After randomization, the estimated coefficients of core explanatory variables cluster around zero and exhibit a normal distribution. With P-values exceeding 0.1, most regression coefficients fail significance tests, meeting placebo test expectations. This confirms unobservable factors can be excluded, The benchmark regression results remain robust.

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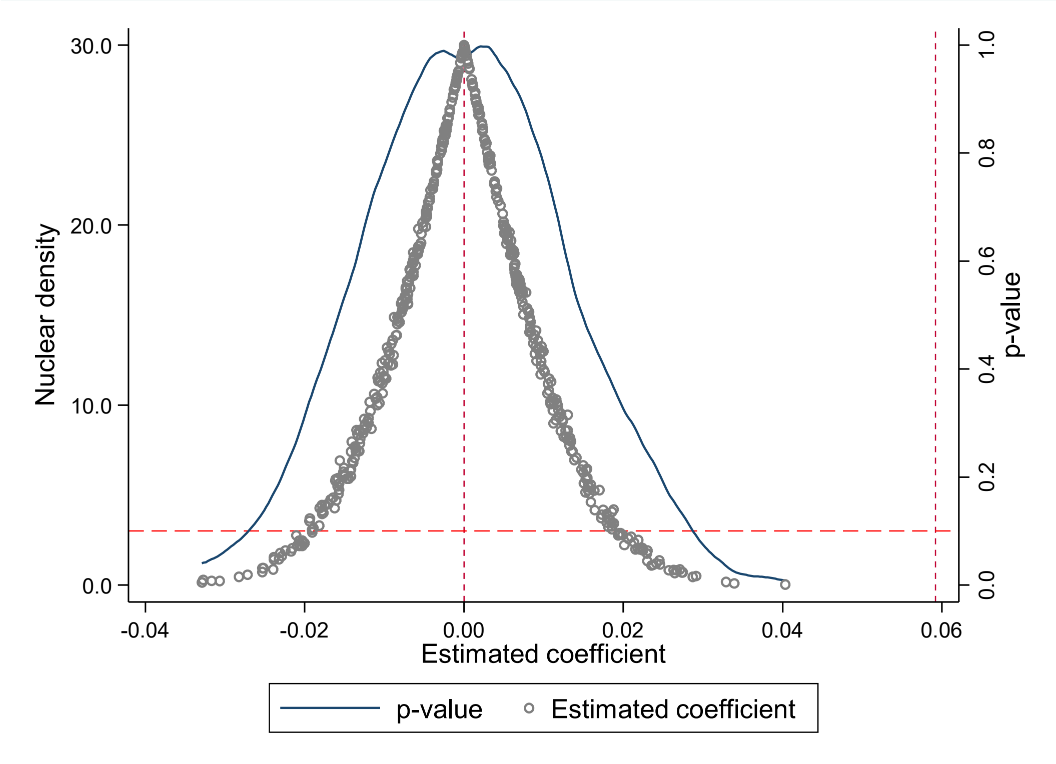

Figure 2. Placebo test Results

4.3.2. Replace the Core Explanatory Variable

Drawing on the artificial intelligence measurement framework proposed by Trefler and Sun [13] , we adopt the number of artificial intelligence patent applications and the number of artificial intelligence enterprises as substitute indicators for the original core explanatory variables.[14]

4.3.3. Lags the dependent variable by One Period

Lags the Dependent Variable by One Period to Address Endogeneity Issues Arising from Time Effects.

4.3.4. Eliminate the Impact of Policies Implemented During the Same Period

Eliminating the interference of relevant policies during the same period. Since 2019, the Ministry of Industry and Information Technology has established four batches of pilot zones for AI innovation and application. Given the overlapping policy objectives between pilot zones and experimental zones, they are likely to influence the development of new-type productive forces. Additionally, the State Council has approved the establishment of pilot free trade zones (FTZs).[15] The core mission of FTZs lies in leveraging institutional innovation to facilitate the free flow of production factors across domestic and international markets, thereby promoting their optimal allocation. Since factor combination efficiency serves as a key indicator for evaluating new-type productive forces, the establishment of FTZs theoretically holds the potential to inject additional momentum into their development. To eliminate the interference of these two policy categories on regression results, dummy variables representing AI pilot zones and FTZs were incorporated into the regression model.[16]

The inspection results are detailed in Table 4. The regression coefficients for the pilot policies are all significantly positive, indicating that the results have passed the robustness test.[17]

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Table 4. Robustness Test Results

Variable	Replace Explanatory Variable 1	Replace Explanatory Variable 2	Lagged Explained Variable (1-Period Lag)	Exclude Policy Interference 1	Exclude Policy Interference 2
AI Patent Apps	**0.0235*** (0.003)**				
AI Ent		**0.0323*** (0.008)**			
Treat×post			**0.0212*** (0.006)**	**0.0194*** (0.007)**	**0.0265*** (0.007)**
AI Pilot Zone Policy				**0.0103 (0.009)**	
China FTZ Policy					**0.0013 (0.004)**
Control Variables	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**
Intercept Term	**-0.2858*** (0.082)**	**-0.5018*** (0.083)**	**0.8752*** (0.216)**	**-0.3621*** (0.075)**	**0.8815*** (0.215)**
Individual Fixed	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**
Time Fixed	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**
Observations	**330**	**330**	**300**	**330**	**330**
R^2	**0.732**	**0.718**	**0.965**	**0.783**	**0.965**

4.4. Mediation Effect Test

Based on the preceding theoretical analysis, it can be inferred that talent agglomeration and industrial structure exert mediating effects in the process by which pilot policies influence the development of new productive forces.[18] To verify the role of these mediating variables in shaping new productive forces, regression analyses were conducted based on Equations (2) and (3), with results presented in Table 5.

Table 5: Results of the Mediational Effect Test

Variable	(1)Talent Agglomeration	(2)NP	(3)Industrial Structure	(4)NP
Treat×post	**0.2455*** (0.053)**	**0.0235*** (0.007)**	**0.0643*** (0.022)**	**0.0515*** (0.007)**
Talent Agglomeration		**0.0388*** (0.009)**		
Industrial Structure				**0.0348*** (0.011)**
Control Variables	**Yes**	**Yes**	**Yes**	**Yes**
Intercept Term	**-4.3018*** (0.529)**	**1.0818*** (0.232)**	**-4.8861*** (1.134)**	**0.0511 (0.266)**
Individual Fixed	**Yes**	**Yes**	**Yes**	**Yes**
Time Fixed	**Yes**	**Yes**	**Yes**	**Yes**
Observations	**330**	**330**	**330**	**330**
R^2	**0.895**	**0.962**	**0.831**	**0.944**

Columns (1) and (2) present estimation results with talent agglomeration as the mediating variable, while columns (3) and (4) correspond to tests of the industrial structure mediation effect. Column (1) shows that the pilot policy regression coefficient is significantly positive at the 1% level, indicating that this policy effectively promotes talent agglomeration. In Column (2), both the pilot policy and talent agglomeration regression coefficients are positively

ISSN: 2710-0588

significant, confirming that pilot policies enhance new quality productivity through the talent agglomeration pathway. Column (3) indicates that the estimated coefficient for the pilot policy is also significantly positive at the 1% level, confirming its role in advancing industrial structure optimization and upgrading. Column (4) shows statistically significant and positive regression coefficients for both variables, demonstrating that the pilot policy indirectly enhances new-quality productivity levels by promoting industrial structure advancement.

5. Conclusion and Recommendations

5.1. Research Findings

This study employs the policy framework of China's New Generation AI Innovation Development Pilot Zones as a quasi-natural experiment to systematically examine the impact, mechanisms, and regional heterogeneity of AI on new-type productive forces. Key findings are as follows:

First, the pilot zone policies exert a significant direct promotional effect on the development of new-type productive forces. The benchmark regression results show that the coefficient of the core explanatory variable Treat×Post is significantly positive at the 1% level, validating research hypothesis H1. This effectively addresses the constraints of insufficient scale of new production factors and inefficient factor allocation, providing sustained momentum for the development of new-type productive forces.

Second, industrial structure upgrading and talent aggregation play important mediating roles in the process of pilot zone policies empowering new-type productive forces. The mediation effect test indicates that pilot zone policies not only provide a solid industrial foundation for new quality productivity by driving the transformation of industries toward high-end, intelligent, and green development, but also create a “talent magnet” through institutional attraction, platform empowerment, and brand effects. This attracts high-end human capital, thereby indirectly enhancing the level of new quality productivity. Research hypotheses H2 and H3 are both validated.

Third, the effect of pilot zone policies on enhancing new quality productivity exhibits significant heterogeneity. Geographically, the policies exerted the most pronounced impact on eastern regions, followed by western regions, while their effects on central and northeastern regions were insignificant. This correlates closely with regional differences in AI industrial foundations, infrastructure support, and industrial structure characteristics. In terms of factor endowments, provinces with higher openness levels leveraged more preferential policies and shared resources, while those with higher marketization levels relied on more robust innovation environments. Both types of provinces demonstrated significantly greater policy promotion effects than their counterparts with lower levels.

Fourth, the benchmark regression results demonstrate robust stability. After conducting randomized placebo tests, replacing core explanatory variables, lagging the dependent variable by one period, and controlling for contemporaneous policy interference from AI innovation pilot zones and free trade zones, the policy effects in pilot zones still show a significant positive promotion of new productive forces. This indicates that the research conclusions are highly reliable, unaffected by unobservable factors, variable measurement methods, or contemporaneous policy interference.

5.2. Policy Recommendations

5.2.1. Improve the Policy System of the Pilot Zone, and strengthen Precise Empowerment.

Expand the pilot zone's scope, summarize the replicable experiences from the existing 18 pilot zones, extend to provinces in the central and western regions, and build a national network of

ISSN: 2710-0588

artificial intelligence innovation; optimize the policy supply structure, formulate differentiated tools for regional shortcomings, and strengthen hardware investment or institutional environment construction as needed; establish a dynamic evaluation and adjustment mechanism, track the policy effectiveness and adapt to the development needs of new quality productive forces, and enhance the policy relevance.

5.2.2. Activate the Intermediary Transmission Path and Amplify the Synergy Effect.

Promote industrial structure upgrading, accelerate the intelligent transformation of traditional industries, promote "artificial intelligence +" scenarios, cultivate emerging industries and business forms, and expand the carriers of new quality productive forces. Strengthen talent aggregation, improve incentive and guarantee policies to attract high-end talents, build a research and education industry platform, cultivate versatile talents, and strengthen the support of human capital.

5.2.3. Base on Regional Differences, Implement Differentiated Policies.

The east focuses on core technology research and cluster construction, and leverages the leading role of innovation and the spillover effect of technology; the west increases investment in intelligent infrastructure, relies on characteristic industries to develop differentiated application scenarios; the central and western regions and the northeast focus on upgrading traditional industries, strengthen cooperation with eastern technical talents, and improve the industrial foundation. Establish a regional collaboration mechanism to promote the cross-regional flow of factors, narrow the development gap.

5.2.4. Optimize the Development Environment and Consolidate the Innovation Foundation.

Increase investment in education to cultivate high-quality workers suitable for intelligent production; guide financial resources to tilt towards artificial intelligence and emerging industries, alleviate enterprise financing constraints; deepen market-oriented reforms, improve the data element allocation mechanism, enhance the efficiency of factor combination; expand opening up, encourage enterprises to participate in international cooperation, introduce high-quality resources, and enhance the internationalization level of the industry.

Acknowledgments

This work is supported by Anhui University of Finance & Economics 2025 Undergraduate Research innovation fund project fund, Project number: XSKY25226.

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