

Analysis and Research on Influence Mechanism of High-Quality Development Based on Economic Big Data Analysis with Artificial Intelligence

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Abstract. With the progress of science and technology, artificial intelligence plays a vital role in the procedure of high quality economic growth. By the Bartik instrumental variable method, this paper research the level of artificial intelligence in 30 provinces and propose an framework to examine the correlation between artificial intelligence technology and economy. The results show that artificial intelligence technology has significantly promoted high quality economic growth, and the level of urbanization has enhanced the role of artificial intelligence in hoisting high-quality development. This result helps to clarify the economic effects of artificial intelligence and offers a theoretical reference for improving the science and technology evaluation system and data for studying the effect between artificial intelligence and economy.

1 Introduction

The research of the 19th National Congress of the Communist Party of China states that increasing the application of the artificial intelligence and the economy is a key factor for China to improve supply-side structural reforms. At present, the world economy is in a downturn. In the aspect of the complicated international environment, the trend of anti-globalization and the serious effect of the new coronavirus pneumonia epidemic, China must develop economy, take high quality development as the focus of China's economic development, and build a economic system based on internal economic cycle as the theme and internal and external dual economic cycle. Artificial intelligence is a driving power to increase the transformation of production mode and macroeconomic growth. In 2021, the amount of China's artificial intelligence exceeded CNY 400 billion, the number of enterprises exceeded 3000, and the annual investment and financing amount of the industry exceeded CNY 140 billion. Artificial intelligence is accelerating the integration and development of various industries in the real economy, and is a power for industrial transformation, quality and efficiency improvement.

Artificial intelligence is a driving power to increase the transformation of production mode and macroeconomic growth. In 2021, the amount of China's artificial intelligence exceeded CNY 400 billion, the number of enterprises exceeded 3000, and the annual investment and financing amount of the industry exceeded CNY 140 billion. Artificial intelligence is accelerating its integration with various natural industries and becoming a 'new engine' for industrial transformation and modernization, quality, and efficiency improvement. However, In order to

determine whether artificial intelligence is related to economic development, researchers start from its key factors. Based on recent research, researchers found that the relevant research is mainly scattered in the use of industrial robots, the theory of the impact of artificial intelligence on the labor force and the meta-universe, as well as industry research, case analysis, and theoretical research of artificial intelligence technology. Few scholars have conducted rigorous empirical tests and profound theoretical analyses on the relationship between artificial intelligence and development of high quality, which provides a certain space for the development of this research.

According to existing literature and theories and China's provincial panel data, a comprehensive measure of artificial intelligence and the high quality growth of economic are promoted to research the correlation between them. An empirical evidence based on a dynamic environment is given to enforce the recent review of artificial intelligence. Second, using urbanization rate as one of the influencing factors to better supplement the research framework of economic growth.

2 Literature Review and Theoretical Hypothesis

2.1 Theoretical Mechanism of Artificial Intelligence Affecting High-Quality Economic Development

The concept of artificial intelligence was first held in Dartmouth, the United States, in 1956. From that time on, the academic community has been paying attention to it. However, due to the amount of data, models, invariance, and other reasons, the development of artificial intelligence

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has been limited [1]. Professor Winston of MIT proposed that artificial intelligence is actually the use of computers to help complete work. John McCarthy believes that artificial intelligence is a scientific project to manufacture intelligent machines, especially to develop intelligent computer programs. The new generation of artificial intelligence generally recognized by scholars is technology that widely applies to the theoretical methods of mathematics, physics, biology, logic, and other major based on computer equipment to simulate human thinking and decision-making. Artificial intelligence has the economic properties of synergies, substitutability, and creativity. It emphasizes the deep integration with the economic society and the diversification of application scenarios. That has leading advantages in the new round of scientific and technological revolution in China [2].

The new generation of network information technology is gradually moving toward the application stage. In order to meet the growing material needs of the people, only by reforming the supply side can the economy continue to develop at a high speed. This growth mode integrates the development concept of green and sharing [3]. Artificial intelligence has a profound impact on the future growth of a social economy. Existing research displays that the growth of artificial intelligence can optimize the industrial structure, and increase high quality economy growth. The research of artificial intelligence to increase economy is manifested in the following content. First, artificial intelligence improves production efficiency by optimizing industrial structure. The characteristics of machine learning, " multiple intelligences " and " human-machine integration " can replace social behavior to induce new technological and economic paradigms, increase the improvement of traditional industries, and promote production efficiency [4]. Second, artificial intelligence can drive consumption structure upgrading. The development of artificial intelligence promote the public's demand for green and intelligent products, and the expectations for effectiveness and efficiency, and variety of consumer goods continue to increase. The upgrading of green consumption increase green production [5]. Finally, artificial intelligence can optimize the factor endowment structure and promote the level of factor supply. The integration of artificial intelligence and the real economy promotes innovation and fosters high-end factor markets and improves product quality. The concentration of human capital is mainly due to the fact that information technology has improved the efficiency of learning and the learning environment, making it easy to learn anytime and anywhere [6]. This paper proposed hypothesis H1.

H1: The application of artificial intelligence technology helps to achieve high-quality economic development.

2.2 Regulatory mechanism

Urbanization refers to the process of urban population growth, which reflects the improvement of the urban population [7]. Urbanization is an important engine of China's economic growth. It has become a consensus that the urban-rural structure and growth change in the same direction. There are common phenomena in the classical

model and research literature of development economics. There is a significant positive relation of the optimization of urban-rural structure and economic growth [8]. A development strategy aiming at optimizing urban-rural structure produce high-quality economic development. Urbanization has shifted a lot of workers, leading to changes in China's industrial structure from primary to secondary and tertiary industries and in the employment structure of residents [9]. The urbanization factor improves the supply of labor force, makes the economy more large-scale, improves the labor productivity through high-quality talents, and thus provides human resources for economic development.. Hypothesis H2 is as follows:

H2: Degree of urbanization reinforces the role of artificial intelligence in promoting high-quality economic development.

3 RESEARCH CONSTRUCTION

3.1 Sample selection and data sources

The provinces data is collected from 2011 to 2019. We collected 270 sample data from China Electronic Information Industry Statistical Yearbook, China Labor Statistical Yearbook, China Statistical Yearbook and other data sources, and conducted statistical analysis through Stata software.

3.2 Variables

3.2.1 Explained variable: high-quality economic development (*Hed*)

According to the growth framework and the current development situation, 18 indicators are selected from the five aspects of innovation, coordination, greenness, openness and sharing to form an index evaluation system for economy in China.[10].

3.2.2 Explanatory variable: artificial intelligence(*Rob*)

The growth rank of artificial intelligence in each region is measured by the number of robots installed [11]. The industry categories in the China Labor Statistical Yearbook and the International Robot Alliance are matched, and the Bartik instrumental variable method is used to construct the following equations to compute the robot installation density at the provincial level.

$$Rob_{it} = \sum_j R_{jt} \times l_{ijt} \quad (1)$$

where Rob_{it} represents the installation density of industrial robots in province i in year t , and l_{ijt} represents the population proportion of industry j in province i in year t .

3.2.3 Regulated variable: urbanization level(*Ur*)

Urbanization refers to the historical process of continuous population aggregation from rural to urban areas. A improvement of the urban population used for expressing the level of urbanization[12].

3.2.4 Control variable

The correlation variables between AI and economic development are defined as foreign trade dependence, R&D investment intensity, industrial structure and investment efficiency. The calculation method is shown in Table 1

TABLE I. RELATED VARIABLES DESCRIPTION

| Variable type | Variable name | Variable symbol | Computed mode |
|----------------------|-----------------------------------|-----------------|---|
| dependent variable | high-quality economic development | <i>Hed</i> | Constructing the Evaluation Index System of High-quality Economic Development |
| independent variable | artificial intelligence | <i>Rob</i> | Robot installation density (unit / million people) |
| regulated variable | urbanization level | <i>Urs</i> | Urban population by province / total population by province |
| control variable | efficiency of investment | <i>Ie</i> | Investment rate / GDP growth rate |
| | industrial structure | <i>Is</i> | ertiary industry output / GDP |
| | r&d investment intensity | <i>Rdi</i> | R & D expenditure / GDP of industrial enterprises above designated size |
| | dependence on foreign trade | <i>Dft</i> | Total import and export / GDP |

3.3 Model Setup

Based on 270 research samples, this paper research the relation between artificial intelligence and economy and build a benchmark regression model as follows.

$$Hed_{i,t} = \alpha_0 + \alpha_1 Rob_{i,t} + \alpha_2 Control_{i,t} + \varepsilon_{i,t} \quad (2)$$

$Hed_{i,t}$ represents the economy factor of province *i* in year *t* to represent the economy rank of each province. $Rob_{i,t}$ represents the artificial intelligence level of province *i* in year *t*. α_0 is a constant term. α_1 represent the relation between artificial intelligence and economy, so α_1 is the core parameter. If α_1 is significantly positive after controlling a series of characteristic variables $Control_{i,t}$, artificial intelligence enhances or improves the level of economic development. Conversely, if α_1 is significantly negative, artificial intelligence weakens or reduces the level of economic development. $\varepsilon_{i,t}$ denotes a random perturbation term.

4 Authentic Proof Analysis

4.1 Baseline regression results

Columns (1) and (2) of Table III show the regression results with and without control variables. It can be seen that AI has a positive effect on economy, while the

variables of industrial structure and foreign trade dependency have a significant effect on economy, but investment efficiency and intensity are negatively related to economic development.

4.2 Moderating effect analysis

Based on the propagation model of artificial intelligence and economy, continue to study the correlation between these two variables. Relevant studies believe that urbanization has improved the urban population, stimulated social consumption and effectively promoted China's economic development [9]. On the basis of this, this paper brings the urbanization rate index into the research model to test whether the urbanization rate will affect AI and economic development.

$$Hed_{i,t} = \beta_0 + \beta_1 Rob_{i,t} + \beta_2 Rob * Urs + \beta_3 Control_{i,t} + \varepsilon_{i,t} \quad (3)$$

Equation (3) represents the moderating variable urbanization level. It is judged whether the urbanization rank has a moderating effect on the correlation of artificial intelligence and economy through the significance of the interaction term coefficient. The regression results are shown in column (3) of Table III. The coefficient of the interaction term is 3.3178 at the 1 % level, indicating that the higher the urbanization rate of each province, the more it promotes the positive impact of artificial intelligence on high-quality economic development.

TABLE II. BENCHMARK REGRESSION AND ADJUSTMENT EFFECT ANALYSIS

| Variable | (1) | (2) | (3) |
|------------------|-----------------------|-----------------------|-------------------------|
| <i>Rob</i> | 0.0101*** (4.7294) | 0.0148*** (8.1917) | -0.0566*** (-2.7650) |
| <i>Rob * Urs</i> | | | 0.1100*** (3.3178) |
| <i>Urs</i> | | | 0.1317 |

| | | | |
|-------------|-------------------------|-------------------------|-------------------------|
| | | | (0.8545) |
| <i>Ie</i> | | -0.0310** (-2.1899) | -0.0300* (-2.0363) |
| <i>Is</i> | | 0.0028*** (4.4386) | 0.0022* (1.7940) |
| <i>Rdi</i> | | -5.1648*** (-4.5624) | -3.9850*** (-3.3303) |
| <i>Dft</i> | | 0.0001*** (5.8652) | 0.0002*** (5.5468) |
| constant | 0.2869*** (144.4042) | 0.1754*** (5.8407) | 0.1064** (2.2834) |
| sample size | 270 | 270 | 270 |
| R^2 | 0.0941 | 0.3500 | 0.3625 |

Note : *, **, *** are significant at the level of 10 %, 5 %, and 1 %, respectively; in parentheses are t values adjusted by robust standard errors; since the Rob and Rob * Urs coefficients are small, the values in the table are shown as the original values * e4.

5 Conclusions and Implications

According to the new development concept and the actual development situation, 18 indicators will be selected from five perspectives of innovation and environmental friendliness to establish a framework for economy in China. Second, after testing the moderating effect of the urbanization rate, the rank of urbanization enhances the role of economy growth. The higher the level of urbanization, the more significant the effect of artificial intelligence in improving economy.

In conclusion, on the basis of research and analysis, we proposes the following strategies:

First of all, the application of AI technology can improve and optimize the industrial structure, consumption structure and employment structure, and provide a strong impetus for economy.

Secondly, the key aspect of the development of AI are talent training and technology development. Therefore, to maintain economy growth, we need to increase the input in AI talent training and technology development.

Finally, urbanization is an key role in economy growth, which requires China to optimize the urban structure during urbanization planning and promote labor productivity through technological transformation.

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