AI Insights: Minimum Wage Hikes and Robot Adoption Trends Toward 2035 Industrialization

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Abstract

This study reveals that an increase in the minimum wage leads to a higher probability of firms adopting robots (extensive margin). For firms that have already integrated robots into their production, an increase in the minimum wage does not affect the quantity of robots used (intensive margin), as the variation in labor costs induces two countervailing effects: the substitution effect and the scale effect. In terms of the intensive margin, the impact of the minimum wage is more pronounced in industries with high product substitution elasticity. Regarding the extensive margin, the influence of the minimum wage rise is more significant for high-productivity firms in their decision to use robots. The findings of this paper provide insights for China's ambitious 2035 vision of essentially achieving a new type of industrialization.

Keywords Minimum Wage; Labor Costs; Industrial Robots

1. Introduction

Over the past forty years since the reform and opening up, China's economy has achieved rapid growth. The report of the 19th National Congress pointed out that China's economy has shifted from a stage of rapid growth to a stage of high-quality development, which is a major judgment made in response to the changes in China's economic development conditions and stages. This shift in the development model means that the past extensive growth model, which relied on low labor costs and simple scale expansion, must be transformed. It is necessary to upgrade the industrial structure and achieve the goals of improving the quality of economic growth and a virtuous economic cycle. The improvement of the final product quality is inseparable from the improvement of the quality of intermediate inputs (Bastos et al., 2018; Fan et al., 2018a; Haichao Fan, et al., 2020). Therefore, in the process of industrial transformation and upgrading, the upgrading of several major factor inputs is crucial. In terms of human capital, it is necessary to improve the education level of the labor force, which complements the upgrading of the industrial structure. In terms of capital goods input, it is necessary to enhance the quality of intermediate products in the production process, which helps to improve production efficiency and enhance the international competitiveness of the final product. In the "14th Five-Year Plan Outline" passed in October 2020, clear goals have been set for how to improve the quality and production efficiency of intermediate products in the process of achieving high-quality economic development, and to make China a strong manufacturing country. The 2035 vision clearly states that by 2035, China will "basically achieve new-type industrialization, informatization, urbanization, and modernization of agriculture, and build a modern economic system." In modern manufacturing enterprises, industrial robots are an important driving force in the construction of the "four modernizations." The extensive use of robots in the production process can not only improve the quality of intermediate products, thereby helping product quality upgrade, but also promote attention to the education level of workers and investment in human capital. Understanding the situation and influencing factors of enterprise use of industrial robots is of great significance for implementing the "14th Five-Year Plan" and the goal of high-quality economic development.

According to the report from the International Federation of Robotics (IFR), the countries that widely use industrial robots globally mainly include the United States, Japan, and Germany, etc., whose main characteristics are higher labor costs and higher levels of scientific and technological development. Therefore, the use of industrial robots is closely related to a country's labor costs and the level of technological development. Over the past 20 years, as China's demographic dividend has disappeared, labor costs have gradually increased, and the use of robots has also increased significantly. The "World Robotics Report 2020" released by IFR shows that at the beginning of the 21st century, it was still rare for Chinese enterprises to use industrial robots in the production process, with the national stock of robots in use being less than 2,000. After 2009, the number of industrial robots used by Chinese enterprises grew rapidly, and by 2019, the number of newly installed industrial robots reached 140,500, ranking first in the world.

Based on the above preliminary findings, this paper studies the impact of changes in labor costs on the use of industrial robots by enterprises. The "Minimum Wage Regulations" promulgated in 2004 established and began to implement the minimum wage system nationwide. Subsequently, the implementation of the "Labor Contract Law of the People's Republic of China" in 2008 further strengthened the minimum wage system. These legal changes have strengthened the minimum wage regulations and increased the cost of illegal employment for enterprises, providing a starting point for our study of the impact of changes in labor costs on the use of robots by enterprises.

We study the impact of the rise in the minimum wage on two aspects of corporate robot usage decisions: the extensive margin and the intensive margin. First, we explore the decision of whether enterprises use robots, that is, the impact on the extensive margin. Second, if the enterprise has already used robots, we explore the decision on the number of robots used by the enterprise, that is, the impact on the intensive margin. Based on the model of Helpman et al., (2004), in the enterprise production function, workers and robots are substitutes. Enterprises compare the marginal benefits of using robots with the cost of installing robots. We derive four testable hypothesis propositions. First, the probability of enterprises using robots increases with the rise of wages. Second, the higher the productivity of the enterprise, the greater the impact of wage increases on the probability of using robots. Third, for manufacturers using robots, the impact of wage increases on the number of robots used is uncertain because the substitution effect (the substitution of robots for labor after the rise of labor costs) and the scale effect (the reduction of production scale caused by the decline in product demand after the rise in product prices due to the rise in production costs) have opposite effects. Fourth, the negative impact of wage increases on the number of robots used is greater in industries with higher product substitution elasticity, regardless of enterprise productivity.

We have collected rich enterprise-level data to test the above four propositions. The data sources mainly include minimum wage data, China's industrial enterprise data, provincial statistical yearbooks, and urban-level socioeconomic data provided by CEIC. The situation of enterprise robot usage comes from China's customs import and export data. After merging these data, we obtained a panel data of enterprises and years from 2004 to 2012, including 350,451 enterprises. In the empirical design, we considered the potential endogeneity problem. Since the decision of whether enterprises use industrial robots is not only affected by the local minimum wage but also may be related to the local socioeconomic conditions. We conducted research using the data structure of border city pairs (Dube et al., 2010), and added enterprise fixed effects and city pair-year fixed effects to control most of the omitted variable problems.

The empirical results basically support the propositions put forward by the model. The rise in the minimum wage leads to an increased probability of enterprises using robots, and this effect mainly exists from 2008 to 2012. This indicates that after the implementation of the "Labor Contract Law," the national increase in labor costs has led to an increase in the probability of enterprises using robots. Our baseline results show that from 2008 to 2012, a 10% increase in the minimum wage will increase the probability of enterprises using robots by 0.114 percentage points, and the scale of the effect is about 60% of the average probability of enterprise robot usage. In terms of the intensive margin, for enterprises that have already adopted robots, the rise in the minimum wage does not affect the number of robots used by the enterprise. This is because changes in labor costs will bring two opposite effects at the same time, that is, the substitution effect and the scale effect. Therefore, the impact of the minimum wage on the use of robots on the intensive margin is uncertain.

We further tested the assumptions proposed by the model through empirical examination. We first separated and identified the scale effect and substitution effect on the intensive margin. Using the heterogeneity of demand elasticity across different industries, we verified that the negative scale effect of the minimum wage increase on the number of robots used is greater in industries with higher product substitution elasticity. Secondly, we calculated the ratio of the number of robots to the number of workers, which eliminates the scale effect and only reflects the substitution effect. We confirmed that after removing the scale effect, the positive impact of the minimum wage increase on the intensive margin of robot usage is present. Finally, we calculated the total factor productivity of enterprises and included it in the regression with the minimum wage and the triple interaction of the two research periods. The results show that the impact of the minimum wage increase on the probability of enterprises using robots is greater in enterprises with higher productivity, and this effect only exists after 2008, which is consistent with the model's prediction. However, for enterprises that have already used robots, the regulatory effect of total factor productivity on the minimum wage is not significant, and the tests before and after 2008 are also not significant. These heterogeneous results help to understand the differences in robot usage among different enterprises and provide references for localities to formulate targeted policies.

At present, the literature on the impact of the minimum wage increase on enterprises in China is growing (Fang and Lin, 2015; Gan et al., 2016; Hau et al., 2020; Huang et al., 2014; Long and Yang, 2016; Mayneris et al., 2018; Liu Guanchun et al., 2017; Ma Shuang, 2012; Ma Shuang and Qiu Guangqian, 2016; Wang Huanhuan et al., 2019; Zhang Jun et al., 2017). For example, Ma Shuang et al. (2012) studied the relationship between the minimum wage increase and the average wage and employment of enterprises, as well as the relationship between the minimum wage increase and the entry of foreign capital. Ma Shuang and Qiu Guangqian (2016) found the promoting effect of the minimum wage increase on the rise in export prices of labor-intensive products. Liu Guanchun et al. (2017) found that the rise in the minimum wage standard is conducive to improving the misallocation of resources. In addition, Zhang Jun et al. (2017) analyzed the impact of the minimum wage from the perspective of employment regularization. Wang Huanhuan et al. (2019) studied the impact of the legal strengthening of the minimum wage system in 2004 on the probability of enterprises' outward direct investment. This paper has made important progress on the basis of the above literature. Our research finds that there is a substitution relationship between the use of robots and the use of labor by enterprises, which is a different substitution relationship from that of outward direct investment and is also a further exploration in the field of capital substitution for labor.

In addition, this paper also deepens the understanding of the relationship between labor costs and enterprise robot usage decisions. A large number of literature focus on the substitution of labor produced by the use of robots (Acemoglu et al., 2020; Dixon et al., 2020; Fan et al., 2021; Giuntella et al., 2019; Koch et al., 2021). A small part of the literature discusses the factors affecting the enterprise's use of robots (Cheng et al., 2019). Most of the research on robot usage is based on IFR data (Acemoglu and Restrepo, 2022; Graetz and Michaels, 2018; Wang Yongqin and Dong Wen, 2020). Among them, Wang Yongqin and Dong Wen (2020) used industry data to estimate the robot penetration of enterprises and found the substitution effect between the application of robots and the demand for labor in enterprises. In contrast, we use customs data, which can directly reflect the actual situation of enterprises using robots, which is similar to the data processing in Humlum (2019) and Fan et al. (2021). Unlike Humlum (2019) who studied the relationship between robot application and labor market dynamics, we focus on the causal relationship between the rise of labor costs in China and the adoption of robots. Unlike Fan et al. (2021), we focus on the differences in the impact of the minimum wage on the extensive and intensive margins of enterprise robot usage. In the model and empirical test of the intensive margin, we construct the dependent variable of the robot usage ratio, and use the demand elasticity of products for heterogeneous tests, with the purpose of distinguishing the substitution effect and scale effect on the intensive margin.

Finally, our article is also related to the literature that discusses both the extensive and intensive margins (Chaney, 2008; Gopinath and Neiman, 2014; Fan et al., 2018b). Chaney (2008) introduced heterogeneous export costs on the basis of the Melitz model and found that the impact of product substitution elasticity on the extensive and intensive margins in international trade is different. Gopinath and Neiman (2014) studied the impact of the Argentine crisis on the behavior of enterprises importing intermediate goods and found that the number of enterprises that stopped importing intermediate goods on the extensive margin did not decrease significantly, but the micro data showed that there was a large fluctuation in the import volume within the enterprise on the intensive margin. Compared with the existing literature on the differences between the extensive and intensive margins, we explore the differences in the enterprise's decision to use robots on the extensive and intensive margins after the implementation of the minimum wage law.

The rest of the article is arranged as follows: The second part introduces the research background, including China's minimum wage system and the use of industrial robots; the third part establishes the theoretical model; the fourth part is the empirical design, data sources, and descriptive statistics; the fifth part presents the baseline empirical results; the sixth part is further empirical testing; the seventh part is the conclusion.

2. Research Background: Minimum Wage and Robot Usage

(1) China's Minimum Wage System

China's national minimum wage legislation began in 1993 and was written into the "Labor Law" in 1994. The law stipulates that provincial-level administrative units should consider the characteristics of different regional economic development and industries to formulate appropriate minimum wage rates. However, this provision was not fully and effectively implemented. In 2004, the former Ministry of Labor and Social Security formulated the "Minimum Wage Regulations," strengthening the enforcement of the minimum wage system and significantly increasing the compensation paid by enterprises for violating the minimum wage provisions. Since then, China's minimum wage legal system has been established and implemented nationwide, so our empirical research period starts from 2004. Existing literature has used this event to study the impact of minimum wages on corporate decision-making (Gan et al., 2016; Fan et al., 2018c; Wang Huanhuan et al., 2019).

The "Minimum Wage Regulations" require provincial government units to set minimum wage standards by referring to local urban resident economic development levels, consumer price indices, employment conditions, and average worker wages. Local governments can flexibly set minimum wages for different areas and have considerable autonomy in the actual implementation process. Therefore, in the following empirical research process, we will include a series of city population and economic development indicators as control variables to control factors that may affect the setting of minimum wages.

The "Labor Contract Law of the People's Republic of China" has been implemented since January 1, 2008. The "Labor Contract Law" emphasizes the protection of workers and effectively promotes enterprises to follow minimum wage standards, strengthening the implementation of the minimum wage system. Wang Huanhuan et al. (2019) summarized the three impacts of the 2008 "Labor Contract Law" in promoting the development of the minimum wage legal system. First, the "Labor Contract Law" has created a stricter overall regulatory environment. Second, the law has promoted the widespread establishment of labor contracts between employers and workers, significantly increasing workers' awareness of rights protection. Third, the "Labor Contract Law" has expanded the scope of application of the minimum wage standard, significantly narrowing the scope of autonomy applicable to enterprises. Overall, after 2008, the national labor cost has increased significantly. The strengthening of the minimum wage legal system has led to an increase in the minimum wage in various regions, and the labor cost for enterprises has increased accordingly. Therefore, in the empirical analysis, we use 2008 as the time segment division point.

(II) Robot Usage

The subject of this paper's research is industrial robots. According to the ISO 8373:2012 definition, industrial robots are industrial automation equipment that can have fixed or movable positions, capable of automatic control, repeatable programming, multi-functional and multi-purpose, with the position of the end effector being programmable in three or more degrees of freedom. Graetz and Michaels (2018) and Acemoglu and Restrepo (2022) also study industrial robots as defined. The IFR has conducted surveys, research, and analysis on the use of robot technology worldwide and is the authoritative international organization related to robot technology. According to Cheng et al., (2019), in 2013, China was the fifth-largest user of industrial robots in the world. By 2016, China's usage of industrial robots exceeded Japan, becoming the world's largest user of industrial robots, accounting for 19% of the global share.

The source of industrial robots used in China has changed significantly in the past decade. Before 2012, most industrial robots were imported. The IFR report shows that of the 23,000 new robots used in China in 2012, only about 3,000 were manufactured by domestic suppliers, and the number of robots manufactured domestically was even smaller before that. To change this situation, at the end of 2013, the Ministry of Industry and Information Technology issued the "Guiding Opinions on Promoting the Development of the Industrial Robot Industry," proposing to cultivate 3 to 5 leading enterprises with international competitiveness and 8 to 10 supporting industry clusters by 2020, with domestic robots accounting for about 45% of the high-end robot market share. In 2015, the State Council issued the "Made in China 2025," which listed high-end CNC machines and robots as one of the top ten key development areas and included it in the first ten-year action plan for China to become a manufacturing powerhouse. The "14th Five-Year Plan" released in 2020 clearly includes the basic realization of new-type industrialization in the 2035 vision, and the use of industrial robots is an important driving force to achieve this goal. With the introduction of a series of government plans, governments at all levels have increased investment in the robot-related industry, encouraging robot innovation and research and development. From 2012 to 2017, the number of robots manufactured domestically in China grew at an average annual rate of 86%, and about 30% of the new industrial robots added in China in 2017 were domestically made (Cheng et al., 2019).

In our empirical research, the situation of enterprise-level use of robots comes from customs data, that is, the number of robots imported by enterprises. Since the number of robots manufactured domestically in China increased rapidly after 2012, our empirical research sample ends in 2012 to reflect the actual situation of enterprises using robots. Moreover, after 2012, government departments increased subsidies and investment in the robot industry, and choosing the end of 2012 as the sample period can exclude the impact of these non-labor cost changes on enterprises' decisions to use robots.

3. Model

This section introduces a simplified model to examine the decision-making of firms regarding the adoption of robots in a nation with a population of L, where each worker provides labor inelastically, equating to one unit of work.

(I) Preferences and Endowments

The economy is assumed to have a representative consumer with a utility function that encompasses a range of differentiated goods. The utility function is structured to reflect the consumption of each good ω and a substitution elasticity greater than one, indicating the diversity of goods.

(II) Firm Behavior

Each firm in the differentiated product industry is engaged in the production of a unique product. Productivity levels vary across firms, with the production function of a firm with productivity φ incorporating the quantities of workers and robots used in each task, as well as a parameter that measures their relative productivity.

(III) Firm Decision on Robot Adoption

In simplifying the model, we consider a partial equilibrium scenario with fixed labor wages and robot rentals. Firms decide on the use of robots in production by comparing the associated profits against those of not using robots, given the consumer demand. The profit of a firm not utilizing robots is contrasted with the profit when robots are employed. A firm opts to adopt robots based on a condition that reflects the interplay between fixed costs associated with robot installation and the firm's productivity levels.

The model extends to discuss the impact of wage increases on the probability of robot adoption, highlighting that higher productivity firms are more influenced by wage hikes. Additionally, it differentiates between the extensive and intensive margins of robot adoption, noting that while wage increases can positively impact the decision to adopt robots (extensive margin), the impact on the number of robots adopted by firms that already use them is less clear due to competing substitution and scale effects. The model concludes with propositions that set the stage for empirical testing regarding the relationship between labor costs and industrial robot adoption.

4. Empirical Design, Data, and Measurement

This section outlines the empirical framework for testing the propositions derived from the model, describes the sources of data used, and explains how key variables are measured.

(I) Empirical Design

We employ empirical data to examine the impact of minimum wage increases on the probability and extent of firms' adoption of robots. Firms' decisions regarding the use of robots are influenced not only by local minimum wages but also by local socioeconomic conditions. To control for these regional factors, we adopt a paired city structure for empirical analysis, as suggested by Dube et al. (2010). Paired cities are defined as two cities from different provinces that share a common provincial administrative boundary. The minimum wage for each city is set by their respective provincial governments, and other natural and economic conditions are similar, which can be controlled by city-pair-year fixed effects.

To test the impact of minimum wage increases on the extensive and intensive margins of firms' robot use before and after 2008, we estimate the following empirical model, which includes controls for city characteristics and labor force traits, and accounts for fixed effects at both the firm and city-pair-year levels.

(II) Data Sources

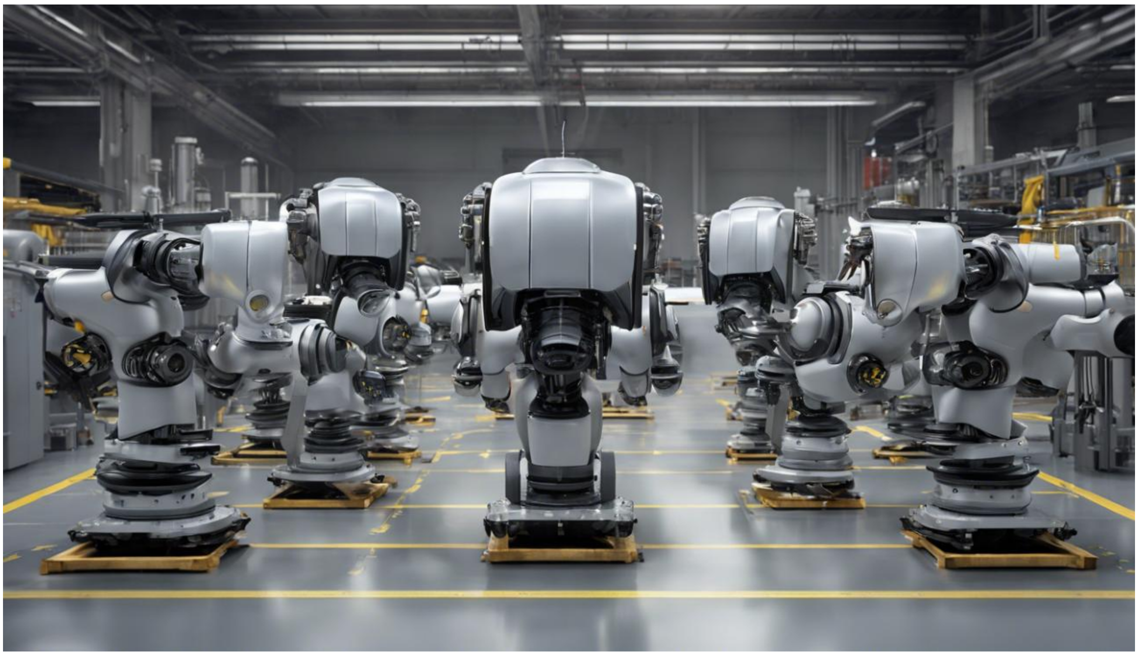
The minimum wage data at the provincial and city levels are collected manually from various sources, including local government websites, government announcements, and local human resources and social security statistical bulletins. Other city and provincial-level data are sourced from the CEIC economic database and provincial statistical yearbooks.

Firm-level data are derived from the China Industrial Enterprise Database, which includes a wealth of information such as enterprise name, location, employee information, ownership structure, financial statements, and more. The customs data on enterprise robot imports come from the China Customs Import and Export Data, providing comprehensive import and export information organized by enterprise product and trade country.

(III) Descriptive Statistics

After merging the data from the aforementioned sources, we have a panel dataset of enterprises from 2004 to 2012, comprising 3,504,510 observations. Among them, 630 enterprises have imported robots during this period, and we conduct the intensive margin effect test of minimum wage on robot use within this subsample.

Descriptive statistics for various variables are presented, revealing that the proportion of Chinese enterprises using robots during this sample period is very low, at only 0.12%. Among the enterprises that have imported robots, the average number of robots used is modest, indicating a broad disparity in robot adoption among firms, with most firms using only one or two robots.



5. Benchmark Regression Results

This section presents the benchmark regression results that verify the predictions of our theoretical model, examining the impact of minimum wage increases on firms' decisions to adopt robots and the number of robots used, with a focus on changes before and after the year 2008.

All regressions incorporate firm fixed effects and city-pair-year fixed effects. The dependent variable in the first two columns represents whether a firm has adopted robots. The regression results indicate that the interaction term between minimum wage and the period before 2008 is not significant, while the interaction term with the period after 2008 is positive and significant at the 5% level. This suggests that the positive impact of minimum wage increases on the probability of firms adopting robots is primarily observed after the implementation of the Labor Contract Law in 2008, which led to a nationwide increase in labor costs.

Economically, we find that a 10% increase in the minimum wage during the period from 2008 to 2012 resulted in a 0.114 percentage point increase in the probability of firms adopting robots. Given that the average probability of robot adoption by firms in this period was only 0.19%, a 10% increase in the minimum wage raised the adoption probability by approximately 60% of the average adoption rate.

The third and fourth columns of the table test the impact of minimum wage increases on the number of robots used by firms. The dependent variable is the natural logarithm of the number of robots used by firms that have adopted robots, plus one. The regression results show that the impact of minimum wage increases on the number of robots used by firms is statistically insignificant in both periods, which aligns with Proposition 3's conclusion that the overall effect of minimum wage increases on the intensive margin is uncertain due to the countervailing substitution and scale effects.

We have conducted a series of robustness tests on the empirical results. First, we discussed the impact of omitted variables. Our benchmark regression model has strictly controlled for enterprise fixed effects and city pair-year fixed effects, but there may still be omitted variables that affect both the minimum wage and enterprise robot decisions. We added city-level import and export levels and capital stock, as well as enterprise-level employee numbers, capital stock, and sales variables, and found that the empirical conclusions did not change. Secondly, instead of conducting regressions in the city pair data structure, we included all enterprises in the cities in the regression, and found that the increase in the minimum wage still only affected the extensive margin of enterprise robot usage decisions, not the intensive margin. Lastly, we used instrumental variables for two-stage least squares estimation. The first instrumental variable is the average minimum wage of all cities in the same province as the city in the same year. The second instrumental variable follows the approach of Bai et al. (2021). In each year, we rank the per capita GDP of all prefecture-level cities and divide them into 20 groups. For the endogenous variable of a city's minimum wage, we select the average minimum wage of other cities in the same group as the instrumental variable. The instrumental variable regression results are similar to the benchmark regression, with the minimum wage having different impacts on the extensive and intensive margins of enterprise robot usage.

6. Further Empirical Examination

This section delves deeper into the empirical analysis, aiming to dissect the nuanced effects of minimum wage increments on the extensive and intensive margins of robotic adoption among firms. It focuses on distinguishing between the scale effect and the substitution effect.

(I) Disentangling Scale and Substitution Effects on the Intensive Margin

The response of the intensive margin to increased labor costs is influenced by two opposing dynamics: the scale effect and the substitution effect. The substitution effect suggests that as labor costs escalate, firms are more likely to replace human labor with industrial robots. On the flip side, the scale effect implies that an increase in labor costs leads to higher production costs, potentially reducing output and, by extension, the demand for industrial robots.

To isolate these effects, we first examine the heterogeneity in product demand elasticity, proposing that the negative scale effect of minimum wage increases is more pronounced in industries with greater product substitution elasticity. We then calculate the ratio of the number of robots to the labor force, which, by eliminating the scale effect, reveals only the substitution effect. The results support the hypothesis that after removing the scale effect, the positive impact of minimum wage increases on the intensive margin of robot adoption is more evident.

(II) Heterogeneity Based on Firm Productivity

To explore the heterogeneous impact based on firm productivity, we introduce an interaction term between firm productivity, as measured by total factor productivity (TFP), and the minimum wage. The empirical findings indicate that for firms with higher initial TFP, the impact of minimum wage increases on the likelihood of robot adoption is more significant, aligning with the proposition set forth in the model. However, in the sample of firms that have already adopted robots, the initial productivity level does not significantly moderate the impact of the minimum wage on the number of robots used, which is consistent with the model's predictions.

The regression results, which include interaction terms for minimum wage, TFP, and thetime period, along with their corresponding double interaction terms, show that the influence of minimum wage on the extensive margin of robot adoption is primarily observed after the year 2008. For the intensive margin, the impact of minimum wage on the number of robots used by firms does not appear to be significantly moderated by the initial productivity level, regardless of the time period examined.

This chapter's empirical investigation offers a more refined understanding of how minimum wage adjustments influence a firm's decision to adopt robots, underscoring the importance of considering both the extensive and intensive margins of adoption and the role of firm productivity in this context.

7. Conclusion

As the process of industrialization continues to deepen and labor costs increase, industrial robots play an increasingly vital role in China's journey to becoming a manufacturing powerhouse and achieving a new type of industrialization. This paper studies the impact of changes in the minimum wage and the implementation of the Labor Contract Law in 2008 on labor costs. It confirms from both theoretical and empirical perspectives that an increase in the minimum wage leads to an increased probability of enterprises using robots. This phenomenon mainly occurred during the period from 2008 to 2012. For enterprises that have already adopted robots, an increase in the minimum wage does not lead to an increase in the use of robots. The paper finds that, in terms of the intensive margin, the impact of the minimum wage is greater in industries with higher product substitution elasticity. In terms of the extensive margin, the impact of an increase in the minimum wage on whether high-productivity enterprises use robots is greater.

Against the backdrop of sound minimum wage laws and the continuous rise of minimum wages, the welfare of workers gradually increases. For enterprises, however, the dividends brought by low labor costs in the past are decreasing. Enterprises can choose to use robots to reduce production costs and increase their profits. In the process of promoting the use of robots, China should be fully aware of the dual nature of robot use. On the one hand, it should fully leverage the domestic market advantage, expand investment in robot research and development, and reduce the cost of using robots, thereby encouraging more enterprises to choose industrial robot production and complete the transformation to a new type of industrialization. On the other hand, it should pay full attention to the negative impacts such as unemployment caused by replacing workers with robots. Overall, the economic development levels vary across different regions in China, and there is a significant difference in labor costs, so the use of robots by different enterprises is very different. The results of this paper help to understand the reasons why enterprises make decisions on whether to use robots and the number of robots, assist local governments in formulating appropriate policies, guide enterprises to make the most suitable choices, and steadily move towards the goal of becoming a manufacturing powerhouse and the 2035 vision.

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