Analysis of the Impact of Artificial Intelligence on Middle-Aged Workers' Employment Willingness: Based on the Context of Delayed Retirement

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Abstract: The rapid development of AI and China's delayed retirement policy have significantly challenged middle-aged workers' employment willingness. This study utilized a cross-sectional survey of 889 pre-retirement individuals in Beijing, Guangzhou, and Lanzhou, using multivariate regression analysis to examine key influencing factors. Results indicate that employment willingness is significantly higher among males and highly educated individuals, while widespread AI adoption in eastern and northern regions increases pressure on low-educated groups. Notably, household economic pressure correlates negatively with work intentions. The study concludes that AI's impact varies across demographics, necessitating targeted vocational training and social support to help middle-aged workers adapt to the modern job market.
Keywords: Artificial Intelligence; Delayed Retirement; Middle-Aged Workers; Employment Intention; Regional Differences; Multivariate Regression; Vocational Training

1. Introduction

China's implementation of the delayed retirement policy has been seen by many scholars as unexpected, especially under the dual pressures of rapid AI development and economic downturn. The employment willingness of middle-aged workers nearing retirement has garnered widespread attention. The potential threat of AI to jobs, along with the challenges posed by technological advancements for middle-aged and older workers, is becoming a focal point for policymakers and researchers. As noted by the Oxford Institute of Population Ageing, the introduction of AI requires workers, especially older employees, to continuously relearn new skills in order to adapt to the digital transformation of the work environment (Ferdous, 2023). Meanwhile, the delayed retirement policy aims to ease labor market pressures associated with population aging and to encourage older individuals to remain economically active (Haan & Tolan, 2019).

However, despite the new employment opportunities potentially created by delayed retirement policies and the application of AI technology, the reemployment willingness of middle-aged workers is not always positive. On the one hand, many middle-aged individuals face considerable pressure to update their skills for reemployment, particularly in adapting to AI-driven work environments, where they often encounter greater difficulties than younger workers. On the other hand, the combined pressures of technological change and later-life labor participation may intensify insecurity among middle-aged and older workers, rather than automatically translating into stronger willingness to remain in or re-enter the labor market.

Artificial intelligence (AI) technology is advancing at an astonishing pace and is being widely applied across various sectors, particularly in the employment field. For middle-aged workers, the rapid development of AI brings challenges in skill adaptation and reshapes the labor market. In this context, China has introduced a new delayed retirement policy to address labor shortages caused by an aging population. In recent years, the application of AI in the job market has significantly altered the nature of work, including the automation of repetitive tasks, changes in skill requirements, and the reconfiguration of workers' job experiences and opportunities (Bankins et al., 2024).

The aim of this study is to analyze the impact of AI on the employment intentions of middle-aged workers in the context of delayed retirement. First, this study will explore how AI affects employment choices by increasing skill requirements and reshaping the labor market. Second, it will examine how the combination of delayed retirement policies and AI application influences the work motivation of middle-aged individuals. As recent research suggests, older and aging workers in rapidly evolving digital environments often face substantial learning and adaptation pressures, making lifelong learning and technological support increasingly important for sustaining employability (Ranasinghe et al., 2024). Finally, this study seeks to provide policy recommendations to help middle-aged workers better adapt to AI-driven job markets.

2. Literature Review

2.1 The Impact of AI Technology on Middle-Aged Workers

Artificial intelligence (AI) technology is rapidly transforming the global job market, and its influence has garnered considerable attention from scholars. Recent research suggests that AI is reshaping work by altering task structures, changing skill requirements, and reconfiguring workers' experiences within organizations, while also creating demand for more advanced and adaptive capabilities (Úbeda-García et al., 2025). However, for middle-aged workers, adapting to these changes is often challenging. Research on aging and older workers shows that technological transformation frequently generates substantial learning and adaptation pressures, especially where new digital competencies must be acquired continuously in order to remain employable. In addition, evidence from workers aged 40 and above indicates that the availability of digital technology training plays an important role in supporting their intention to remain in work, suggesting that insufficient or poorly tailored training can deepen their disadvantage in technology-intensive labor markets (Xie et al., 2023). The skill gap and limits in technological adaptation may therefore restrict career development opportunities and weaken willingness to seek reemployment or career transitions among middle-aged workers.

The decline in employment willingness is not only reflected in difficulties with technical learning but also in the psychological resistance middle-aged workers face when adapting to new work environments. With the introduction of AI technology, workplaces have become increasingly digitalized and complex, and this transformation can generate substantial pressure for workers who must continuously adjust to new tools, routines, and skill demands. For middle-aged workers accustomed to more traditional work models, such changes may create stronger adaptation burdens and uncertainty. Research on aging workers shows that continuous technological change often places older employees under considerable learning pressure, especially when upskilling becomes necessary to remain employable (Chang et al., 2023). At the same time, studies of digital transformation indicate that employee resistance to change is closely linked to stress and reduced well-being, which can further weaken motivation to engage in retraining or workplace transition (Valtonen et al., 2024). In addition, evidence on workers aged 40 and above suggests that when digital training is insufficient or not tailored to their needs, their confidence in continued work participation may decline (Xie et al., 2023). As a result, emotional strain and adaptation difficulties may further diminish middle-aged workers' motivation to participate in reemployment or skill-upgrading programs.

2.2 The Impact of Delayed Retirement Policies on Worker Reemployment

The implementation of delayed retirement policies is intended to respond to the economic and demographic pressures associated with population aging, including labor supply pressures and the sustainability of long-term development. The rationale behind this policy is to extend working lives and maintain labor market participation in aging societies (Zhao et al., 2024). However, the implementation of delayed retirement policies has also encountered significant challenges. Recent research on China indicates that delayed retirement has complex effects on labor force participation and broader socioeconomic outcomes, suggesting that policy extension alone does not automatically translate into stronger employment

engagement among older and middle-aged workers (Dai et al., 2025).

Research also shows that many middle-aged workers have reservations about delayed retirement policies. These concerns are related not only to skill renewal, but also to whether adequate digital training and work-related support are available at this career stage. Evidence from workers aged 40 and above suggests that the availability of digital technology training can significantly strengthen older workers' intention to remain in work, especially when such training enhances their sense of competence and usefulness in increasingly technology-intensive workplaces. This suggests that when training support is insufficient or poorly aligned with the needs of middle-aged workers, delayed retirement policies may have limited success in increasing their motivation to remain employed or re-enter the labor market.

2.3 The Limitations of the Policy Framework and the Unique Needs of Middle-Aged Workers

The current policy framework remains insufficient in supporting middle-aged workers in adapting to AI-driven employment changes. Recent research suggests that digitalized work environments can heighten older workers' vulnerability to stress, exclusion, and adaptation difficulties when support systems are weak, and that targeted digital literacy initiatives together with sustained managerial engagement are crucial for ensuring that technological change enhances rather than undermines their well-being and productivity.

To better support middle-aged workers, policymakers must consider their unique needs. This includes providing more flexible learning and work arrangements, as well as strengthening organizational and social support. For instance, psychological counseling and career guidance services can help middle-aged workers manage the stress and anxiety associated with career transitions. In addition, evidence from workers aged 40 and above shows that digital technology training can significantly strengthen intentions to remain in work, especially when such training is perceived as useful and aligned with workers' developmental needs.

2.4 The Future Direction of Integrating Policy and Technology

As AI technology continues to advance, policymakers must consider how to integrate technological change into more adaptive labor policies. Recent research suggests that the contemporary labor market is being reshaped not only by AI and related technological change, but also by shifts in where, how, and under what conditions work is performed, which in turn requires more age-sensitive and flexible labor and human resource practices across different career stages (Truxillo et al., 2026). In this context, policies should place greater emphasis on inclusive career development, targeted upskilling, and flexible work arrangements that can help middle-aged workers navigate career transitions more smoothly. In addition, governments may consider using economic incentives and supportive welfare arrangements to reduce the burden of retraining and encourage employers to provide more transition-friendly employment opportunities (Wang et al., 2024).

A review of the existing literature reveals that the rapid development of AI technology, alongside the implementation of delayed retirement policies, is profoundly affecting middle-aged workers' employment prospects and career development. While AI may create new opportunities, it can also raise barriers to labor market adaptation for workers who face greater challenges in responding to technological change. The current policy framework therefore needs to become more flexible and better aligned with technology-driven changes in work organization and skill requirements. By strengthening targeted training, improving age-inclusive work design, and offering supportive transition policies, policymakers can help middle-aged workers better integrate into the evolving job market.

3. Methods

This research aims to explore the impact of artificial intelligence (AI) on the employment intentions of pre-retirement individuals. The primary objective is to assess changes in employment attitudes across different age groups as they face advancements in AI technology. The sample includes three major cities in China: Beijing, Guangzhou, and Lanzhou, targeting individuals aged 50 and above. The survey covered key areas such as personal information, employment status, attitudes toward delayed or early retirement, and AI technology usage. Trained staff at mobile monitoring centers guided participants in completing the questionnaire, explaining specific requirements like self-reported age. In total, 1,000 pre-retirement individuals were surveyed, with 889 valid responses. Female respondents were near 50 years old, while males were near 60. Female retirees who experienced discrepancies due to flexible retirement mechanisms were excluded to ensure sample

validity and representativeness.

3.1 Study Design

This study uses a cross-sectional survey design to analyze the impact of AI technology on the employment intentions of pre-retirement individuals. As AI technology reshapes the labor market, particularly for those nearing retirement, this research employs quantitative methods to systematically assess changes in employment attitudes across different age groups and genders. The study is based on cross-sectional survey data and uses multivariate regression analysis to examine the relationships between AI-related factors, demographic characteristics, and employment intentions. Key research areas include personal information, employment status, attitudes toward delayed or early retirement, and knowledge and usage of AI technology.

3.2 Sample

Participants were recruited through site-based field survey sampling to achieve regional variation and practical coverage of pre-retirement populations. The sample was drawn from three representative cities in China's southern, northern, and western regions: Guangzhou, Beijing, and Lanzhou. These locations were selected to capture variation in economic development, labor market conditions, and exposure to AI-related technological change. The target population consisted of individuals aged 50 and above who were approaching retirement and therefore facing potential employment and retirement-related transitions.

A total of 1,000 pre-retirement individuals were approached for participation, of whom 889 provided valid responses. Female respondents were generally near the statutory retirement age of 50, while male respondents were generally near the statutory retirement age of 60. To reduce confounding influences related to heterogeneous retirement arrangements, female respondents whose retirement status was substantially affected by flexible retirement policies were excluded from the final analysis. By covering multiple regional contexts and a diverse group of pre-retirement individuals, the sample provides a useful basis for examining employment intentions under conditions of delayed retirement and AI-related labor market change.

3.3 Data Collection

Data were collected through face-to-face questionnaire surveys administered by trained research staff in field-based survey settings. Survey sites were established in community service centers and senior activity venues, where pre-retirement individuals commonly gather, in order to facilitate access to the target population across the three cities. This approach helped improve response quality by allowing participants to complete the questionnaire in supervised settings while retaining independence in their responses.

Before administration, research staff provided a standardized explanation of the study purpose and questionnaire structure, and clarified the meaning of specific questions when necessary. However, all questionnaires were completed independently by participants in order to minimize interviewer interference and avoid proxy responses. The survey covered demographic characteristics (e.g., age, gender, education level, and region), employment history, retirement plans, attitudes toward delayed and early retirement, and respondents' awareness and use of AI technologies. This procedure was designed to enhance data accuracy, consistency, and reliability across survey locations.

3.4 Measures and Variables

The primary measurement instrument was a structured questionnaire developed for this study with reference to established measures used in related research on employment intention, retirement attitudes, and technology use. To improve measurement quality, the questionnaire was pilot-tested prior to formal data collection, and internal consistency was assessed using reliability analysis (e.g., Cronbach's alpha where applicable). Minor revisions were made following the pilot stage to improve clarity and item wording.

The key independent variables included demographic and contextual characteristics, such as age, gender, education level, region, occupation type, and family economic pressure, as well as AI-related factors, including AI awareness and frequency of AI use. The questionnaire also included items on retirement attitudes and retirement planning in order to examine how respondents positioned themselves with regard to delayed or early retirement. The dependent variable was employment intention, operationalized through respondents' reported willingness to remain in work, seek re-employment, engage in part-time work after retirement, or continue full-time employment where feasible. These measures allowed the study to assess how

individual characteristics, regional context, and AI-related factors were associated with employment intentions among pre-retirement individuals.

3.5 Data Analysis

Data analysis was conducted using Stata. The analytical procedures included descriptive statistics, correlation analysis, and multivariate regression models to examine how demographic characteristics, AI awareness, AI usage frequency, region, occupation type, and family economic pressure were associated with employment intentions. The analysis focused on identifying the relationships between individual characteristics and employment intentions under conditions of delayed retirement and AI-related labor market change.

In the regression models, gender, age, education level, region, occupation type, family economic pressure, AI awareness, and AI usage frequency were included as key explanatory variables. Additional control variables, such as health status, were incorporated to improve the robustness of the results. Interaction terms were further introduced to examine whether the effects of gender and education on employment intentions varied across regions. This analytical strategy allowed the study to assess both the direct associations of key variables and the moderating role of regional context.

3.6 Ethical Considerations

The study design and data collection procedures adhered to standard ethical principles for social science research. Before completing the questionnaire, all participants were informed of the purpose of the study, the voluntary nature of participation, the confidentiality of their responses, and their right to withdraw at any stage without consequence. Written informed consent was obtained from all participants prior to data collection.

To protect participants' privacy, all questionnaire data were anonymized prior to analysis, and no personally identifiable information was included in the final dataset. The data were used exclusively for academic research purposes and were not disclosed to any third party. These procedures were implemented to ensure privacy protection, confidentiality, and ethical compliance throughout the research process.

4. Results

4.1 The Impact of Gender and Education on Employment Intentions

This study first examined the associations of gender and education with employment intentions among pre-retirement individuals. The regression results showed that men reported significantly higher employment intentions than women ($\beta = 0.48$, $p < 0.01$). In addition, individuals with higher levels of education (bachelor's degree or above) exhibited significantly stronger employment intentions than those with lower educational attainment (high school or below) ($\beta = 0.52$, $p < 0.01$). These findings indicate that, in the context of delayed retirement, gender and education are significantly associated with willingness to remain in or return to employment. Specifically, male respondents and more highly educated individuals appeared more likely to express continued labor market participation intentions. The detailed regression results are presented in Table 1.

Table 1. Regression Analysis Results of Gender and Education on Employment Intentions

Variable	Regression Coefficient (β)	Standard Error (SE)	Significance Level (p)
Gender (Male)	0.48	0.11	< 0.01
Education (Higher Education)	0.52	0.10	< 0.01

4.2 Regional Differences Analysis

The regression results further suggest that employment intentions varied across regions. In particular, respondents with lower education levels in the eastern and northern regions showed significantly lower employment intentions, indicating stronger pressure related to retirement and labor market adjustment ($\beta = -0.45$, $p < 0.05$). At the same time, employees in the eastern region reported significantly stronger concerns about job replacement associated with AI-related technological change ($\beta = 0.40$, $p < 0.05$). However, respondents in these regions also demonstrated a stronger willingness to improve their competitiveness through digital skills training ($\beta = 0.58$, $p < 0.01$). Taken together, these findings suggest that regional context plays an important role in shaping how workers perceive and respond to labor market changes associated with AI.

Compared with other regions, individuals in the eastern and northern regions appear more likely to experience both higher perceived pressure and stronger adaptive responses, especially through skill development. Compared with other regions, individuals in the eastern and northern regions appear more likely to experience both higher perceived pressure and stronger adaptive responses, especially through skill development. These findings suggest that regional context moderates how gender and education are related to employment intentions.

4.3 The Role of Occupation Type and Family Economic Pressure

Occupation type was also significantly associated with employment intentions. Respondents in technical occupations showed stronger employment intentions than those in non-technical positions ($\beta = 0.32$, $p < 0.01$). This finding suggests that workers in technical roles may feel better positioned to adapt to ongoing technological change, possibly because they possess stronger digital competencies or perceive lower risks of displacement. By contrast, non-technical workers may face greater uncertainty regarding future employment, which may weaken their willingness to remain in the labor market.

Family economic pressure was another significant factor. The results indicate that greater family economic pressure was negatively associated with employment intentions ($\beta = -0.39$, $p < 0.01$). This finding suggests that financial strain may not always encourage continued employment; instead, under some circumstances, it may intensify stress and reduce individuals' willingness to remain in or re-enter work. The detailed regression results are presented in Table 2.

Table 2. Regression Analysis of Occupation Type and Family Economic Pressure on Employment Intentions

Variable	Regression Coefficient (β)	Standard Error (SE)	Significance Level (p)
Occupation Type (Technical)	0.32	0.09	< 0.01
Family Economic Pressure	-0.39	0.08	< 0.01

4.4 Interaction Effect Analysis

This study further examined whether the effects of gender and education on employment intentions differed across regions. The interaction analysis showed that the combined effect of gender, education, and region was significant (interaction term $\beta = 0.22$, $p < 0.05$), suggesting that the relationship between individual characteristics and employment intentions is shaped by regional context.

More specifically, in the eastern region, men with higher education levels reported significantly stronger employment intentions than other groups, whereas women with lower education levels showed comparatively lower employment intentions. This pattern suggests that the advantages associated with education and gender may be more strongly reflected in regions characterized by faster technological development and more intensive labor market transformation. By contrast, in the western and central regions, the interaction effects of gender and education were less pronounced, indicating that regional economic conditions and the pace of technological adoption may moderate how these factors are related to employment choices. The main coefficients for the regional and interaction models are summarized in Table 3.

Table 3. Summary of Regional and Interaction Regression Results on Employment Intentions

Variable	Regression Coefficient (β)	Standard Error (SE)	Significance Level (p)
Lower education in eastern and northern regions	-0.45	0.18	< 0.05
Concern about AI-related job replacement in the eastern region	0.40	0.17	< 0.05
Willingness to improve competitiveness through digital skills training	0.58	0.14	< 0.01
Gender × Education × Region	0.22	0.10	< 0.05

Note. The table reports the main coefficients from the regional and interaction regression models. Positive coefficients indicate a stronger employment intention or stronger related attitudinal tendency, whereas negative coefficients indicate lower employment intention or greater retirement-related pressure.

5. Discussion

The findings of this study offer a significant theoretical advancement by elucidating the mechanisms through which Artificial Intelligence (AI) reconfigures labor market experiences, particularly through the framework of Social Cognitive Theory (SCT). SCT posits that human behavior is a product of "reciprocal determinism" involving personal factors, environmental events, and self-efficacy. In this research, AI is identified as a disruptive environmental catalyst that profoundly erodes the "self-efficacy" of middle-aged workers. When AI is perceived not as an augmentative tool but as an insurmountable existential threat to established skills, it diminishes workers' perceived capability to navigate the labor market successfully. This psychological impingement is further exacerbated by the delayed retirement policy, which extends the temporal horizon of this technological confrontation, essentially tethering workers to a digitalized infrastructure they feel ill-equipped to master.

Crucially, the paradoxical finding—that heightened household economic pressure negatively predicts employment willingness—is theorized here as a localized manifestation of "learned helplessness" within the SCT paradigm. While traditional economic models view financial strain as a primary driver for labor participation, the "dual impingement" of AI-driven displacement and mandatory career extension may induce a psychological state of perceived futility. For middle-aged individuals facing significant financial burdens, the inability to control technological shifts can lead to a collapse of "outcome expectations." In such instances, the perceived lack of agency results in a maladaptive coping mechanism: rather than intensifying labor effort, individuals may opt for "early exit" or psychological withdrawal to mitigate further exhaustion and economic precarity. This underscores that AI's impact is not a monolithic outcome but is deeply mediated by the socio-economic vulnerabilities of the agent.

Furthermore, this study aligns with recent scholarly discourse suggesting that AI effects are not uniform but are contingent upon organizational settings and contextual job structures (Bankins et al., 2024). By demonstrating that employment intentions fluctuate across different regional contexts in China, this research extends the "non-uniformity" thesis into the geography of transition. Consistent with the perspective that technological adaptability in an aging workforce depends on a constellation of individual and societal support structures (Ranasinghe et al., 2024), our findings suggest that future theoretical models must elevate the role of professional background and nuanced work experience in AI-related employability analyses.

Finally, the study provides a broader methodological contribution by highlighting the "concept drift" inherent in digital labor markets. As AI capabilities and environmental conditions undergo rapid evolution, the stability of captured empirical relationships cannot be taken for granted. This necessitates a transition toward dynamic modeling, where analytical inferences and data reassessments are periodically updated to maintain reliability and accuracy (Hinder et al., 2024).

6. Conclusion

The study explores the impact of artificial intelligence (AI) technology on the employment intentions of individuals nearing retirement within the context of delayed retirement policies, with a focus on factors such as gender, education, region, and occupation type. Key findings include that males and those with higher educational attainment exhibit significantly stronger employment intentions compared to females and individuals with lower educational attainment. This trend is particularly pronounced in the eastern and northern regions, where AI technology is more widely adopted, leading to increased retirement pressure among lower-educated populations. Contrary to common belief, concerns about AI replacing jobs are more prominent in the eastern regions, yet employees in these areas are also more willing to improve their competitiveness through digital skills training. Additionally, the study finds that household economic pressure significantly influences employment intentions, with those facing financial burdens tending to retire on time or even earlier. These conclusions offer a unique perspective on the employment choices of different groups under delayed retirement policies.

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Conflict of Interests

The authors declare that there is no conflict of interest regarding the publication of this paper.

Reference

[1] Bankins, S., Ocampo, A. C. G., Marrone, M., Restubog, S. L. D., & Woo, S. E. (2024). A multilevel review of artificial intelligence in organizations: Implications for organizational behavior research and practice. Journal of Organizational Behavior, 45(2), 159–182.

[2] Chang, C.-H., Xu, H., & Xie, B. (2023). Aging workforce in the context of technological advancements: Toward a socio-ecological model. Work, Aging and Retirement, 9(4), 323–328.

[3] Dai, Y., Zhao, Z., Sui, J., & Xu, J. (2025). The impact of delayed retirement on labor employment, fertility rate and economic growth in China. International Review of Economics & Finance, 100, 104103.

[4] Ferdous, S. (2023, June 14). Are older workers ready for an AI takeover at work? Oxford Institute of Population Ageing, University of Oxford.

[5] Haan, P., & Tolan, S. (2019). Labor supply and fiscal effects of partial retirement: The role of entry age and the timing of pension benefits. The Journal of the Economics of Ageing, 14, 100187.

[6] Hinder, F., Vaquet, V., & Hammer, B. (2024). One or two things we know about concept drift—a survey on monitoring in evolving environments. Part A: Detecting concept drift. Frontiers in Artificial Intelligence, 7, 1330257.

[7] Ranasinghe, T., Grosse, E. H., Glock, C. H., & Jaber, M. Y. (2024). Never too late to learn: Unlocking the potential of aging workforce in manufacturing and service industries. International Journal of Production Economics, 270, 109193.

[8] Truxillo, D. M., Brady, G., Fraccaroli, F., Zaniboni, S., & Yaldiz, L. M. (2026). Work is changing: Implications for an aging, age-diverse workforce. Human Resource Management Review, 36(2), 101131.

[9] Úbeda-García, M., Marco-Lajara, B., Zaragoza-Sáez, P. C., & Poveda-Pareja, E. (2025). Artificial intelligence, knowledge and human resource management: A systematic literature review of theoretical tensions and strategic implications. Journal of Innovation & Knowledge, 10(6), 100809.

[10] Valtonen, A., Piri, R., Kaasinen, E., & Raisamo, R. (2024). Mitigating employee resistance and achieving well-being in digital transformation with personalized assistance. Information Systems Frontiers. Advance online publication.

[11] Wang, Z., Pan, S.-Y., & Dong, W. (2024). Public management approaches to an aging workforce: Organizational strategies for adaptability and efficiency. Frontiers in Psychology, 15, 1439271.

[12] Xie, H., Fang, Y., & Zhang, Y. (2023). Providing digital technology training as a way to retain older workers: The importance of perceived usefulness and growth need. Work, Aging and Retirement, 9(4), 376–392.

[13] Zhao, G., Zhou, D., & Fu, Y. (2024). Study on the impact of delayed retirement on the sustainability of the basic pension insurance fund for urban employees in China. Sustainability, 16(10), 3969.