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ORIGINAL PAPER

THE IMPACT OF THE DIGITAL DIVIDE ON LABOR PARTICIPATION OF THE YOUNG ELDERLY: EVIDENCE FROM CHINA

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Abstract. To alleviate the shortage of labor force and reduce the burden of pensions, it has become an important global trend to advocate labor participation of the young elderly (55-70 years old). However, the rapid development of Internet information technology not only brings digital dividends but also leads to the digital divide among the elderly. In the context of the dual era of digitalization and aging, it is of great significance to study the impact of the digital divide on the labor participation of the elderly. This paper analyzes the three levels of the digital divide (access gap, use gap, knowledge gap) and theoretically analyzes the impact of these three levels of the digital divide on the labor participation of the elderly. Since China is a typical representative country under the intertwined influence of the digital economy and population aging, this paper selects China as the research object. This paper uses the data set released by the China General Social Survey in 2017 (CGSS-2017) and adopts the probit model to empirically analyze the impact of the three-level digital divide on labor participation of the young elderly. The results show that the three levels digital divide has a significant impact on the labor participation of the young elderly, and individual characteristics and family characteristics also lead to significant heterogeneity of labor participation of the young elderly.

Keywords: access gap, digital divide, digital economy, digital literacy, knowledge gap, labor participation, the young elderly, use gap

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ОРИГИНАЛЬНАЯ СТАТЬЯ

ВЛИЯНИЕ «ЦИФРОВОГО РАЗРЫВА» НА УЧАСТИЕ МОЛОДЫХ ПОЖИЛЫХ В ТРУДОВОЙ ДЕЯТЕЛЬНОСТИ: ОПЫТ КИТАЯ

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Аннотация. Глобальное демографическое старение снижает численность граждан трудоспособного возраста и усиливает пенсионное бремя для экономики. Поэтому важной глобальной тенденцией является создание условий для продления участия на рынке труда, так называемых, молодых пожилых (людей в возрасте 55-70 лет). При этом важно учитывать влияние, оказываемое на трудовую активность граждан старшего возраста, информационными технологиями и Интернетом. С одной стороны, они приносят цифровые дивиденды наиболее уверенным пользователям современных технологий, но, с другой, - создают, так называемые, «цифровые разрывы» на рынке труда для работников без устойчивых цифровых компетенций, не имеющих доступа к соответствующей инфраструктуре и (или) рабочим местам. В статье анализируются три уровня такого цифрового разрыва (разрыв в доступе, разрыв в использовании, разрыв в знаниях) и влияние этих трех уровней цифрового разрыва на участие пожилых людей в трудовой деятельности. В качестве объекта исследования выбран Китай как типичная страна, испытывающая взаимосвязанное влияние цифровизации экономики и демографического старения. В статье используется данные Общего социального исследования Китая 2017 г. (CGSS-2017). Авторы применили пробитмодель для эмпирического анализа влияния трехуровневого цифрового разрыва на участие в трудовой деятельности молодых пожилых. Результаты показывают, что каждый из уровней цифрового неравенства оказывает значительное влияние на трудовую активность людей старшего возраста, при этом индивидуальные характеристики человека, а также характеристики семьи отражают неоднородность их трудовой деятельности.

Ключевые слова: разрыв в доступе, цифровой разрыв, цифровая экономика, цифровая

грамотность, разрыв в знаниях, участие в трудовой деятельности, молодые пожилые, разрыв в использовании

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Introduction

The United Nations "World Population Prospects 2019: Highlights" research pointed out that the elderly population in most countries in the world is increasing year by year, and the world is gradually entering an aging stage. Population aging has become the most important social trend and severe challenge in the 21st century [1]. In the future, the elderly population will significantly increase the social burden [2, 3]. To ease the shortage of labor force and reduce the burden of pensions, many countries have implemented active aging policies, many countries have implemented active aging policies. Because the younger age group (55-70 years old) has relatively good physical fitness and professional skills, advocating labor participation of the young elderly has become an important global trend.

At the same time, since the financial crisis swept the world in 2008, the global economic growth in 2019 is still weak, the growth rate of developed countries has slowed down, and the growth momentum of emerging economies has been insufficient. In this context, the sustained and rapid growth of the digital economy has made great contributions to alleviating the downward pressure on the economy and promoting the recovery of the global economy [4, 5]. Entering 2020, the new coronary pneumonia suddenly appeared, and the digital economy that uses digital knowledge and information as the main production factor has not fallen into a severe recession like other industries. With the support of Internet information technology, traditional industries have accelerated their transformation and upgrading to digital, networked, and intelligent industries, and the scale of the digital economy, the proportion of GDP, the growth rate, the proportion of the industrial structure, and the industrial penetration rate have all continued to expand (China Institute of Information and Communications, 2021) [6]. However, the rapid development of Internet information technology not only brings digital dividends, but also leads to significant differences in people's access to Internet information (access gap), use (use gap), and knowledge profit (knowledge gap), namely the digital divide. Restricted by technology, system, culture and the elderly themselves, the ability of the elderly to acquire, use, and identify Internet information technology is much weaker than that of other groups, which seriously affects the labor participation of the young elderly [7, 8]. In the context of the dual era of aging and digitalization, the

digital divide for the elderly and its governance has become a new problem in the process of social development, which requires extensive attention from all walks of life [9]. Therefore, this paper studies from the perspective of the impact of the digital divide on the labor participation of the young and elderly, and empirically analyze the impact of the three-level digital divide on the labor participation of the young elderly.

With the impact of population aging and declining birthrate, the labor force participation rate of the elderly population in most countries in the world is increasing. OECD statistics show that the average labor participation rate among people aged 55-64 in OECD members increased from 50.0% in 2000 to 64.4% in 2019 and for the elderly population aged 65 and over increased from 11% in 2000 to 15.8% in 2019 [10]. With the rapid development of digital information, many scholars believe that the mastery and application of Internet information technology has a positive effect on the labor participation of the elderly [11-14]. However, according to the "49th Statistical Report on the Development of China's Internet" [15], as of December 2021, the number of Chinese Internet users was 10.32 billion, of which the elderly aged 60 and above accounted for only 11.5%, much lower than the proportion of the elderly in the total population of 18.9% in the same period, indicating that many elderly people in China have not been able to catch the informatization express in time. It is worrying that the elderly in the digital economy era, how to adapt to the digital transformation of economic society? What is the impact of digitalization on the elderly with employment needs? Based on these problems, scholars proposed the concept of "Digital Divide" in the 1990s and confirmed that the difference in accessibility (Have or Not Have) and use (Use or Not Use) of the Internet among different groups in society led to the digital divide [16]. With the deepening of research, researchers divide the digital divide into levels: access gap, use gap, and knowledge gap.

First-level digital divide: access gap. The United States National Communications and Information Administration (1999) defines the digital divide as the "digital access gap" [17], "demographic differences between telephone, personal computers, and Internet owners and non-owners". Access gap mainly reflects the material access inequality based on economic and social development, which is mainly affected by national economic strength,

government decision-making, network infrastructure construction, and information technology standards and norms [18, 19]. For the elderly, the digital access gap is mainly reflected in two aspects: one is the age structure difference in Internet access; the second is the regional difference in Internet access [20]. Therefore, the authors propose *Hypothesis 1:* the digital access gap affects the labor participation of the young elderly.

Secondary-level digital divide: use gap. Having the same hardware access conditions does not mean that people use the Internet in the same way. This difference in digital skills and functionalities is the second level of the digital divide. Internet payment, appointments, paperless offices, and online social communication, these new ways of life and production have highlighted the plight of the elderly who are not used to using smart devices. On the one hand, the ability to use the Internet is a major difference in the digital divide among the elderly [21], Therefore, the author proposes *Hypothesis 2:* the digital use gap affects labor participation of the young elderly.

Third-level digital divide: knowledge gap. With the rapid development of information technology, the new media represented by the Internet have profoundly changed the old way of information dissemination, the system has reshaped the way and method of information dissemination, people's existing knowledge structure for the access and use of digital technology There is a significant difference in the effect [22]. The knowledge gap has gradually evolved into the third digital divide. The knowledge gap focuses on the impact of the Internet on knowledge acquisition, that is, the social consequences of differences in Internet access and use [23]. Based on the differences in the digital literacy of the elderly, the author proposes Hypothesis 3: the digital knowledge gap affects the labor participation of the young elderly.

The digital divide of these three levels is interconnected and progressive, in which the access gap is the foundation, the use gap is the process, and the knowledge gap is the result. In the process of the rapid development of digital information technology, restricted by technology, system, culture, and the factors of the elderly themselves, there are great differences between the elderly and other groups in the degree of information technology ownership and application, which eventually leads to many information gaps [20]. The elderly are actively or passively divorced from the information age, excluded from the digital society, and are reduced to "digital refugees". Therefore, it is of great significance to study the impact of the digital divide on the labor participation of the young elderly.

But judging from the current research results, scholars generally do most of the research on the access gap and the use gap, but little on the

$$\text{work}_A_i = \beta_1 divide_i + \beta_2 X_i + \varepsilon_i$$

knowledge gap. Therefore, this paper empirically analyzes the impact of access gap, use gap, and knowledge gap on labor participation of the young elderly.

Results and Discussion

China is a typical representative country under the influence of the digital economy and population aging. Its digital economy and the degree of aging also develop rapidly and have a huge impact on economic and social development, so the author chooses China as the research object. This paper selects the Chinese General Social Survey (CGSS) as the data source, which is a national, comprehensive, and continuous social survey project of Renmin University of China since 2003. CGSS 2017 database contains comprehensive, detailed survey data of residents' Internet use, a total of 12582 valid samples, including 783 variables. Because China has not yet implemented a delayed retirement policy, the official provisions of the 55-year-old retirement for women and 60-year-old retirement for men. The samples selected in this paper are all young elderly aged 55 to 70 years old. After eliminating the missing values and invalid samples, a total of 3377 valid samples are obtained.

Dependent variable. Because this paper wants to verify the impact of the digital divide on the labor participation of the young elderly. First of all, according to the survey item "Which one is more in line with your current work situation?" in the CGSS2017 database, we merged the 8 types of work conditions into binary data (1 for work, 0 for no work), and name it "work".

Independent variable. The academic circles believe that the "access gap", "use gap" and "knowledge gap" of the Internet are the three levels of the digital divide in front of the elderly. Therefore, we selected relevant survey item data as independent variables in the database of CGSS2017. The survey item data "Does your home have Internet access?" was named "access gap"; the survey item data "How often did you use the Internet in the past year?" named "use gap" and named the "use gap"; The interaction term of data multiplication used by "access gap" and "use gap" is named "knowledge gap".

Control variables. From a micro perspective, individual characteristics and family characteristics are important factors affecting the labor participation of the elderly. Therefore, we select the personal characteristics and family characteristics of the respondents as the control variables in the CGSS2017 database, as shown in *Table 1*.

Model settings. This paper investigates the impact of the digital divide on the willingness to work for the young elderly. Since the dependent variable "work" is a dummy variable for binary selection, the probit model is selected for regression analysis, and its function expression is (1):

$$(i=1,\cdots,n) \tag{1}$$

In formula (1), "work_A/" represents the willingness to work, which is the explained variable. "divide/" is the core explanatory variable, "X/" is the control variable, " ϵ /" is the disturbance term, " β_1 , β_2 "

are the parameters to be estimated, and "," is the interviewed household. After substituting the control variable into the formula, its function is expressed as (2):

$$\begin{aligned} \text{work_A}_{\mathbf{i}} &= \beta_1 divide_i + \beta_2 gender_i + \beta_3 health_i + \beta_4 marital_i + \beta_5 education_i + \\ & \beta_6 children_i + \beta_7 area_i + \varepsilon_i \qquad (i=1,\cdots,n) \end{aligned} \tag{2}$$

Table 1 / Таблица 1

Variable Description / Описание переменных

Variable / Переменные	Obs / Количество наблюдений	Mean / Значение	Std. Dev. / Стандарт- ное отклонение	Min / Минимум	Мах / Максимум
Access gap	3351	1.521	0.738	0	1
Use gap	3351	1.866	1.415	1	5
Knowledge gap	3351	1.707	1.542	0	5
Work	3351	0.625	0.484	0	1
Gender	3351	0.488	0.500	0	1
Age	3351	62.458	4.262	55	70
Health status	3351	3.067	1.080	1	5
Marital status	3351	0.807	0.395	0	1
Education level	3351	3.912	2.336	1	13
Number of children	3351	1.986	1.095	0	8
Living place	3351	1.421	0.494	1	2

Source: compiled by the authors based on data from [25] / Источник: построено авторами на основе данных [25]

This paper uses data 16 software to carry out regression analysis on the above variables, and the results show (*Table 2*).

- (1) The P-value of the digital access gap for the labor participation of the young elderly is 0.008, and its marginal effect is 0.026, that is, the young elderly with family access to the Internet are 2.6 % more likely to participate in labor than those without access to the Internet. So, hypothesis 1 holds.
- (2) The P-value of the digital use gap for labor participation of the young elderly is 0.042 and its marginal effect is 0.013, this shows that the possibility of labor participation of the young elderly who use the Internet is 1.3% higher than that of those who do not use the Internet. So, hypothesis 2 holds.

(3) The P-value of the digital knowledge gap for labor participation of the young elderly is 0.004, and its marginal effect is 0.009, that is, the probability of labor participation of the young elderly with a certain degree of digital knowledge is 0.9% higher than that without digital knowledge. So, hypothesis 3 holds.

To verify the robustness of the model, the authors select the survey data (named income) in the database of CGSS-2017 "What is your annual personal income?" to replace the previous dependent variable (work). Since the new dependent variable "income" is a count variable, the main value is $\{0, 1, 2, ... n\}$, which belongs to the Poisson distribution, so the Poisson regression model is used for regression analysis. labor income also had a significant impact (*Table 3*).

Table 2 /Таблица 2

Summary of Regression Results / Результаты регрессионного анализа

Veriebles (Access Gap / Разрыв в доступе		Use Gap / Разрыв в использовании		Knowledge Gap / Разрыв в знаниях	
Variables / Переменные	Marginal Effects / Маржиналь-	P value / Уровень зна-	Marginal Effects / Маржиналь-	P value / Уро- вень значи-	Marginal Effects / Маржиналь-	P value / Уровень
	ные эффекты	чимости	ные эффекты	мости	ные эффекты	значимости
Work	0.026	0.008	0.013	0.042	0.009	0.004
Gender	-0.159	0.000	-0.160	0.000	-0.160	0.000
Age	0.025	0.000	0.025	0.000	0.025	0.000
Health status	-0.055	0.000	-0.055	0.000	-0.056	0.000
Marital status	-0.034	0.085	-0.034	0.086	-0.035	0.077
Education level	0.013	0.001	0.010	0.017	0.010	0.021
Number of children	-0.031	0.000	-0.030	0.000	-0.030	0.000
Living place	-0.296	0.000	-0.293	0.000	-0.289	0.000

Source: compiled by the authors based on data from [25] / Источник: построено авторами на основе данных [25]

Table 3 / Таблица 3

Robustness Analysis Results / Результаты анализа устойчивости

Variables / Переменные	Access Gap /	Use Gap /	Knowledge Gap /	
Variables / Переменные	Разрыв в доступе	Разрыв в использовании	Разрыв в знаниях	
Income	0.273***	0.103***	0.0999***	
Gender	0.235***	0.229***	0.231***	
Age	0.00938	0.0114	0.0120*	

Variables / Переменные	Access Gap / Разрыв в доступе	Use Gap / Разрыв в использовании	Knowledge Gap / Разрыв в знаниях
Health status	0.118***	0.107***	0.107***
Marital status	0.174**	0.165**	0.164**
Education level	0.138***	0.116***	0.116***
Number of children	-0.230***	-0.205***	-0.208***
Living place	-0.765***	-0.726***	-0.717***
	* p<0.05, **p<	0.01, *** p<0.001	

Source: compiled by the authors based on data from [25] / Источник: построено авторами на основе данных [25]

Conclusion

The previous empirical analysis, this paper has the following conclusions.

- 1) The three digital divides do have a significant impact on the labor participation of the young elderly, and the digital "access gap" and digital "use gap" have more marginal effects than the digital "knowledge gap".
- The young male elderly are more likely than the young female elderly to participate in labor under the influence of the digital divide. This may be related to employment discrimination today.
- Age is an important threshold for the young elderly to participate in social activities. Increasing their digital literacy while increasing their age will help them participate in labor.
- 4) Although some scholars believe that the young elderly's participation in work is conducive to physical and mental health, the fact that the young elderly's physical health is weakening is irreversible, so the elderly's health is very likely to reduce the possibility of their labor participation.
- 5) Accepted education is an important means to improve human capital. The higher the degree, the higher the possibility of acquiring knowledge from the Internet and converting it into income.
- 6) The retirement age of the elderly in China is just the rise of their children's careers. Due to the imperfection of China's s social security policy, many young elderlies need to help their children raise grandchildren, do housework, and do other activities, so the more children, the lower the possibility of labor participation of the elderly.
- 7) The young elderly living in cities have more labor opportunities than the rural young elderly. This is closely related to the obvious urban-rural dual differences in China.

Combined with the impact of the digital access gap, the use gap, and the knowledge gap on the labor participation of the young elderly, the authors have the following suggestions.

1) In terms of the Access gap, to eliminate the young elderly digital information technology access threshold. First, improve the digital access infrastructure and network information technology aging construction. Enhance the accessibility of digital technology for the elderly and the young elderly in rural and

- remote areas, improve the aging adaptability of intelligent equipment and services, and enable all the young elderly to effectively enjoy digital dividends. The second is to construct the framework of digital literacy education from the perspective of lifelong learning, strengthen the digital literacy education of the young elderly, and improve the labor participation ability of the young elderly by improving the quality of the young elderly.
- 2) In terms of the *Use gap*, promote the aging adaptation of digital tools and reduce the digital divide between the young elderly and society. It is necessary to fully consider the needs of the young elderly, accelerate the aging transformation of intelligent terminal products such as personal computers and mobile phones, and continuously carry out targeted digital tool training to ensure the safe and smooth use of digital products and services for the young elderly.
- 3) In terms of the *Knowledge gap*, strengthen family and social digital feedback, and promote intergenerational transmission of digital skills. Improve family digital feedback and improve the digital participation ability of the young elderly. The younger generation actively conveys digital thinking, digital skills, and network security awareness to the young elderly, stimulates the confidence of the younger elderly in using new media, and drives the young elderly to better adapt to digital life. At the same time, actively integrate community resources, relying on community cultural activities center to carry out a variety of digital ability and literacy education activities, actively play the role of community workers, volunteers, and peer groups, and actively help the young elderly to improve digital literacy.

Authors' Contribution

The authors have made an equal contribution to the research: collection and analysis of the material; definition of goals and objectives, research methods; formulation and scientific substantiation of conclusions, registration of key research results in the form of an article.

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