IMPACT OF DIGITAL LITERACY ON THE LABOR INCOME OF THE «YOUNG» ELDERLY: EVIDENCE FROM CHINA

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***Relevance.** Under the dual background of the deepening global population aging and the rapid development of the digital economy, the study of the impact of digital literacy on the labor income of the elderly is of social significance in guiding the «young» elderly to continue to participate in social labor, making up for the shortage of labor force, alleviating the pressure of social pension and reducing the burden of family pension. In this regard, it is important to study international cases reflecting the impact of digital literacy on labor income. This paper introduces the influence of digital literacy on the labor income of «young» elderly people from China. **Objective:** to study the impact of digital literacy on the income of Chinese elderly people who have just reached retirement age and to make development recommendations for the interests of all stakeholders in this process: the State, the market, society, the elderly and their families. **Methods:** analysis and synthesis of scientific literature regarding the concept of digital literacy of the elderly and the influence mechanism of digital literacy on labor income. Using Chinese Social Survey 2017 (CGSS-2017) data, Poisson regression method is used to empirically analyze the impact of digital literacy on labor income of the «young» elderly in China. **Results.** This paper confirms that digital literacy has a positive impact on the labor income of the «young» elderly, and analyzes the digital divide formed by the differences in education level and living area of the «young» elderly and the differences in labor income. **Conclusions.** Protecting the labor participation of the «young» elderly by developing their digital literacy is important not only for increasing personal income but also for reallocating family budgets between generations; it is also important for macroeconomics, since the employment of the «young» elderly contributes to reducing labor shortages in the labor market, as a result of changes in the age structure of the working population in the context of global ageing. Maintaining one 's labor activities after reaching working age limits increases budgeted tax revenues, reduces government spending on additional social benefits for low-income older persons and reduces individual and family dependency on social pensions. Equally important is the social benefits of narrowing the intergenerational digital divide. This paper puts forward specific suggestions to improve the digital literacy of the «young» elderly and make up for the digital divide. It is suggested to actively build a 'five-in-one' digital literacy improvement governance system for the elderly with (1) government guidance, (2) market initiative, (3) social linkage, (4) family support and (5) elderly participation.*

Key words: Digital literacy, digital economy, digital divide, «young» elderly, labor income.

Introduction

China's economic development level is constantly improving, and people's life expectancy is growing. According to the China National Bureau of Statistics, at the end of 2021, China was 267 million people aged 60 and older, accounting for 18,9 % of the national population, including 200 million people aged 65 and over and 14,2 % of the national population. At the same time, due to multiple factors, such as fewer women of childbearing age and raising costs, the birth rate in 2021 was 7,18 ‰, falling below 1 % for two consecutive years. Under the dual pressure of high aging and low birth rate, the number of labor force and employed population in China have declined in recent years (Fig. 1, 2), and the problem of labor shortage may occur in the future [1]. The Elderly Human Resources is an important economic resource of the society, and encouraging the elderly reemployment is an effective path to increase the labor force and reduce the pressure of pension [2]. The Chinese government began to implement the national strategy of actively coping with the aging population. In 2020, The Central Committee of the Communist Party of China's recommendations on the formulation of the fourteenth five-year plan for national economic and social development and the vision for the year 2035 stressed the need to «actively develop human resources for ageing and develop the silver-haired economy».
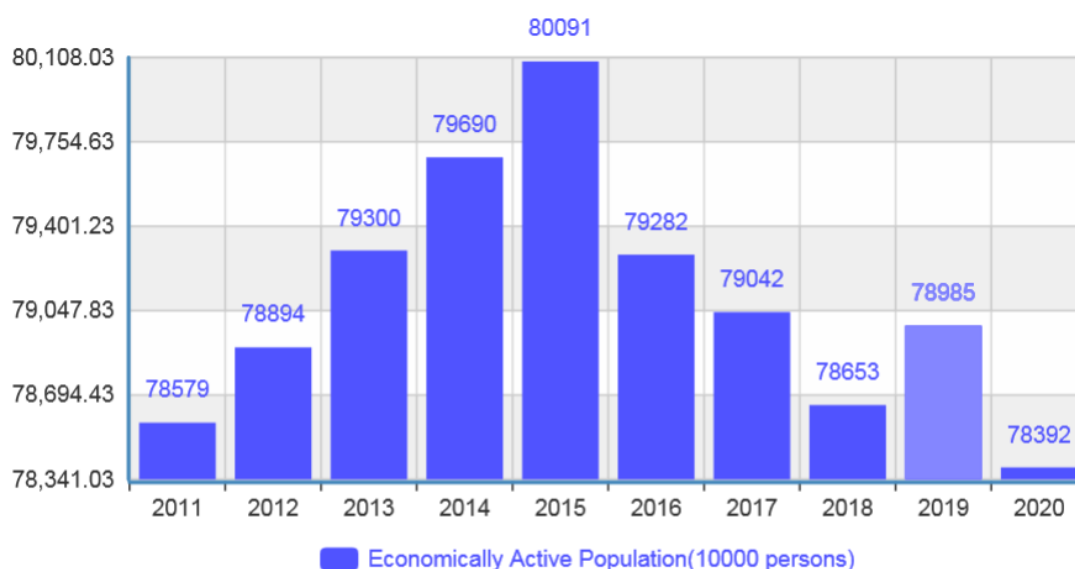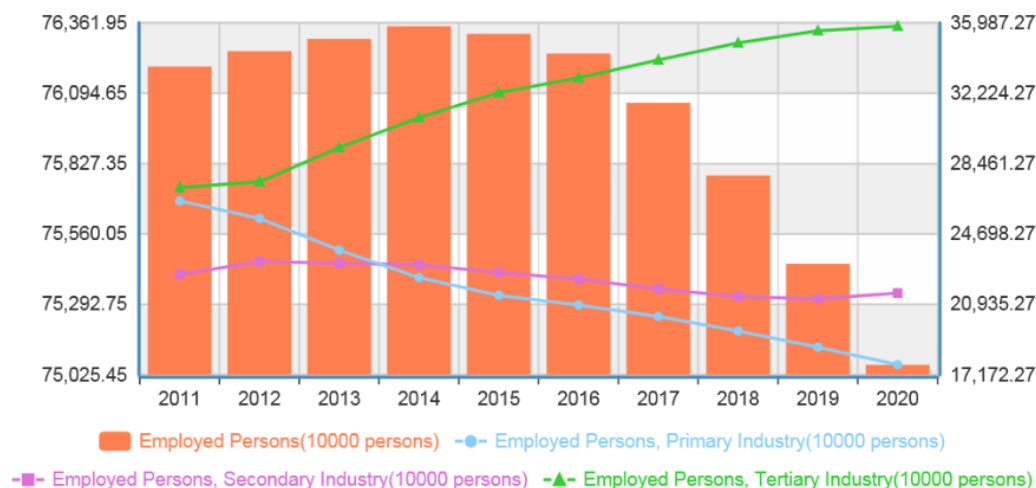

Data source: National Bureau of Statistics of China [3]
Источник: Национальное бюро статистики Китая [3]

Fig. 1. *Trend of China economically active population, 10000 persons*
Рис. 1. *Динамика экономически активного населения Китая, 10 тыс. чел.*

At the same time, with the extensive and deep application of the Internet, big data and artificial intelligence technologies, the continuous emergence of new global economic models and new forms of business, and human society in the way of production and life is undergoing profound changes. Major countries in the world are transforming from industrial economy to digital one. It is characterized by reconstructing production factors with data as the core and promoting the transformation of the economic development model based on material production and material services to the economic development model based on information production and information services. China digital economy is also rapidly developing. According to the «White Paper on the Development of China's Digital Economy (2020)», it is 39,2 trillion yuan in 2020, and the proportion of digital economy in GDP is 38,6 %.

Data source: National Bureau of Statistics of China [3]
Источник: Национальное бюро статистики Китая [3]

Fig. 2. *Trend of China employment population, 10000 persons*
Рис. 2. *Динамика безработных в Китае, 10 тыс. чел.*

Globally, on the one hand, the digital economy has become an important engine of world economic recovery. With the continuous acceleration of economic digitalization, citizens' digital literacy and skills have increasingly become the key indicators of national competitiveness and soft power. The universal application of digital Internet not only improves the information transparency of the labor market [4, 5], but also affects the employment structure, promotes the social division of labor and employment structure, increases a large number of employment opportunities related to the digital economy [6, 7]; the demand of industrial digitization for workers' skills is increasing day by day. The «polarization» employment trend of increasing demand for high skills and decreasing demand for low skills will be more prominent [8–10]. On the other hand, the rapid development of the digital economy has brought about the «digital divide», and created new social issues, [11–14], such as digital inequality, digital poverty, and digital exclusion. Among them, the elderly digital divide phenomenon is more obvious, according to the China Internet development statistical report (48th), as of June 2021, Chinese Internet users is 1,011 billion, including 60 and older only accounted for 12,2 %, lower than the total population ratio of 18,9 %, this shows that there is a large gap between the Internet popularity of the elderly and other groups, and the intergenerational digital gap is becoming increasingly obvious. The improvement of the digital literacy of the elderly has become a problem that cannot be ignored.

Literature review

Digital literacy and digital literacy of the elderly

In 1997, American science and technology journalist Paul Gilster first proposed the concept of «digital literacy», describing it as the use and understanding of information in the digital age, and emphasizing the importance of digital technology as «basic life skills» [15]. «Since the birth of this concept, many researchers have attached more and more importance to digital literacy, scholars such as Autor believe that in the digital economy era, workers must improve their digital literacy and skills to adapt to the pace of the development of digital economy [16]. In 2018, the UNESCO Institute of Statistics (UIS) proposed the representative concept of "digital literacy", spalling "Digital literacy is the ability to access, manage, under-

stand, integrate, communicate, evaluate and create information safely and appropriately through digital technologies for employment, decent jobs and entrepreneurship. It includes competences that are variously referred to as computer literacy, ICT literacy, information literacy and media literacy"» [17. P. 2]. Laanpere summarizes existing digital literacy frameworks around the world, and proposes seven literacy domains based on Internet use, namely, operation domain, information domain, intersection domain, content creation domain, security ethics domain, problem solving domain, and occupation-related domain [18]. It can be seen that network literacy is the core part of digital literacy.

At present, the research of digital literacy in the elderly mainly focuses on the digital divide and digital literacy education. On the one hand, Castilla, Nishijima, Blažič and other scholars generally believe that the intergenerational digital gap of the elderly is obvious [19–21]. Usually, the elderly have less access to or use of the Internet, and most elderly people lack the basic digital literacy needed to use smart devices, so they are more significantly affected by the digital divide than other information vulnerable groups and the general public. On the other hand, Friemel, Tirado-Morueta, Jun and other scholars pay attention to the elderly digital literacy education. They believe that education plays an important role in bridging the digital divide for the elderly, and a good learning environment with family support and social assistance is more conducive to improving the digital literacy of the elderly [22–24]. At the same time, there are relatively few documents and relatively few studies on the digital literacy of the elderly on employment or income in China. The existing research results mainly study the impact of Internet use on employment of the elderly. Lv Mingyang, Zhang Zhengqiang and other scholars believe that internet use promoting employment of the elderly [25, 26], Li Dong believes that internet use reducing employment rate [27]. However, no scholars in China have studied the impact of digital literacy on the labor income of the elderly.

The impact of digital literacy on income

At present, there are very few documents to directly study the impact of digital literacy on income. The Information Research Center of the Chinese Academy of Social Sciences believes that «the level of resident digital literacy is positively related to the income level» [28. P. 18, 19]. The literature on the impact of digital literacy on income mainly focuses on the impact of internet use on income. First, most scholars such as Dimaggio, Forman, Mao Yufei, Liu Shenglong believe that digital literacy has a positive impact on personal income because the use of the Internet makes information transmission faster and easier, reduces transaction costs and improves work efficiency [29–32]. Entorf Dolton and other scholars believe that the use of computers and the Internet has limited impact on personal income [33, 34]. Secondly, in the study of the impact of digital literacy on the income gap, most scholars believe that Internet use has significant individual differences in the income of workers in different regions, gender and educational levels, but the specific impact is controversial. For example, Zhang Yugui, Cheng Mingwang, and other scholars believe that Internet use can significantly narrow the urban-rural gap [35, 36], some scholars such as He Yaping, Xu Kangning believe that due to the accessibility of the Internet and the ability to appreciate and use information, economically developed regions can obtain greater benefits from Internet use, so Internet use will lead to further widening regional income gap [37] .

From the domestic and foreign research results, although scholars have accumulated a certain amount of research on the impact of digital literacy on individual labor income and heterogeneity analysis, there is still a lack of relevant research on the impact of digital literacy on the labor income of the elderly. Based on this, this paper studies the impact of digital liter-

acy on the labor income of the elderly under the background of the booming digital economy and the aging of the population. It is hoped that the research conclusions of this paper can provide theoretical reference for the development of elderly human resources.

Theoretical analysis of influence mechanism

Since the Internet entered the commercial field in the 1990 s, China economic structure, social management and personal behavior have rapidly transformed to digital. The Internet has become an important information infrastructure to promote economic development and social progress in the world today, and digital literacy has become a necessary skill for people to work and live in the digital economy era. The impact of digital literacy on the labor income of the elderly is mainly reflected in the following five aspects.

1. Information intermediary effect

The use of the Internet has broken the limitations of slow speed, poor timeliness and less information content of traditional communication media such as letters, telegrams and telephones, and expanded the access to external information for the elderly. Massive Internet information makes the elderly obtain more abundant employment information across time and space constraints [38]; moreover, the intermediary transmission effect of Internet information reduces the time cost and economic cost of collecting employment information, and provides the probability of job success [39].

2. Social mediating effect

Social capital theory believes that the use of the Internet enables the elderly to carry out more extensive, efficient and frequent social interaction with the help of Internet instant messaging software [40]. The elderly can not only maintain their original social capital, but also integrate into online social groups to form new social capital, thereby reducing the cost of their employment activities [41].

3. Skill learning effect

In recent years, some individuals or institutions on the Internet have been able to upload their knowledge and skills to a website or online community through text, pictures, video and other forms of knowledge sharing, which greatly facilitates the access of ordinary people to intellectual resources [42]. This phenomenon also provides convenience for the elderly to learn knowledge and skills and improve their personal literacy, thus laying the foundation for the elderly express delivery to adapt to the employment skills requirements of the digital economy era [43].

4. Employment channel effect

The rapid development of digital economy has prompted the old economic model to change or die, and created more new forms of employment relying on the Internet [44]. For example, new media marketing, e-commerce, short video broadcast, takeout delivery, courier, etc. Some groups who master digital skills and information channels quickly created a business miracle, formed a number of new formats, injected new vitality into economic development, but also increased more new employment opportunities. Moreover, as major countries around the world pursue the digital economy, these new formats need to absorb a large number of workers with certain digital literacy, which provides a broader channel for the reemployment of the «young» elderly [45].

5. Health demonstration effect

The spread of health knowledge on the Internet provides knowledge resources for the elderly to change their unhealthy habits and establish a correct view of health. On the one hand, the elderly can find suitable exercise guidance programs (text or video, etc.) for their own needs through the Internet, so as to improve their health level [46]. On the other hand,

the elderly enhances their social communication ability through various social media. Massive information resources such as current affairs news, leisure and entertainment, and employment also maintain their due social cognitive ability. The two effectively alleviate the psychological problems such as loneliness, depression, and depression of the elderly after retirement, and then improve their mental health [47]. In short, the Internet provides more demonstration effects for shaping the physical and mental health of the elderly, thus providing opportunities for them to participate in work.

Theoretical hypothesis

However, what are the differences in the level of digital literacy among «young» elderly people depending on their labor income? Based on the previous literature review and theoretical mechanism analysis, in order to verify this problem, this paper puts forward the following six hypotheses:

1. The higher digital literacy, the higher labor income.

2. Differences in personal characteristics of the «young» elderly will lead to differences in digital literacy, thereby affecting labor income.

3. Differences in family size of the «young» elderly significantly affect labor income.

4. Digital literacy has significant indigenous differences in the labor income of urban and rural young elderly.

5. The higher the education level of the «young» elderly is, the higher the digital literacy is, and the higher the labor income is.

6. Regional differences in digital literacy have a significant indigenous impact on the labor income of the «young» elderly.

Data processing and model selection

Data source

China Comprehensive Social Survey (CGSS) is a continuous national, comprehensive and continuous large-scale social survey project carried out by Renmin University of China [48]. The purpose of the survey is to collect data from regular and systematic aspects of Chinese people and Chinese society, summarize the long-term trend of social change, explore social issues of great theoretical and practical significance, promote the openness and sharing of domestic social science research, and provide data for government decision-making and international comparative research. Currently, CGSS has publicly opened the database from 2003 to 2017.

The sample selected in this paper as the research object is between the 55-year-old to 70-year-old. There are a few reasons for calling this cohort of people as a «young» elderly: (1) the legal retirement age of female cadres China is defined as 55 years old (for male cadres the same limit is 60 years old). It is not a secret that the great part of just (officially) retired male and female obviously wants to be economically active, they definitely would like still be employed; (2) there is the case – 2021 from Japanese government (as well as numerous cases regarding other highly developed countries), which have planned to raise the retirement age of corporate employees from 65 to 70; (3) thanks to global aging the employees in age around 70 could be widespread world phenomenon quite soon. Thereby we decided to use the term «young» elderly for people between 55 and 70 years old. After eliminating missing values and invalid samples, a total of 3377 valid samples of CGSS2017 was obtained.

Variable selection
Inertial variable

In order to verify the impact of digital literacy on the labor income of the «young» elderly, according to the survey item in the CGSS-2017 data coding table, «Which is more in line with your current working condition?», the eight kinds of work conditions are combined into binary data (work is 1, no work is 0), which is named «work». Then, according to the survey item in the coding table, «What is your personal total income for the whole year last year?», after excluding missing values and invalid samples, it is named as «Income».

Independent variables

According to current UNESCO definition, digital literacy is the ability to use information and communication technologies to find, understand, evaluate, create, and communicate digital information, an ability that requires both cognitive and technical skills [49]. Based on (1) the official connotation of digital literacy, (2) strong global consensus toward frequency of Internet using as an indicator of digital literacy, and (3) inevitable limitations associated with questions included to the CGSS2017, we made a decision to use data coding of the survey called «In the past year, did you use the Internet frequently?» as the independent variable, which is most close to the aim of the study and named it «Internet usage frequency».

Control variables

According to the research practice in the existing literature, we selected the personal characteristics of the interviewees as control variables in the CGSS-2017 data coding table: gender, age, age square, marital status, health status, education level.

In China, the «three mountains» of education, health care and housing are under enormous pressure, and many children of older Chinese need financial and human support from their parents. Therefore, we take «The number of children» of the «young» elderly as the proxy variable of the family size of the «young» elderly.

As China urbanization rate has exceeded 60 %, cities have gathered a large number of enterprises, but also brought a lot of employment opportunities; meanwhile, China has a large number of elderly people living in rural areas. Therefore, we add the control variable «whether to live in the city» to measure the difference between urban and rural areas, and named it «Live in urban or rural».

Foreign scholars believe that mental health has an impact on labor participation. Moreover, according to the «mental health status of the elderly in China» in the «National Mental Health Development Report of China (2019–2020)» released in 2021, nearly one third of the elderly in China have depression, so we choose «whether they feel depressed» to measure whether negative psychology affects the labor income of the young elderly and name it «Depression level».

Model selection and setting

The purpose of this part is to verify the impact of digital literacy on the work income of the «young» elderly. From the data selected in this paper, the main value is {0,1,2, ... n}, as the dependent variable «Income» belongs to the counting variable, and to the Poisson distribution (Fig. 3), Poisson regression model is used for regression analysis.

Table 1. Variables description
Таблица 1. Описание переменных

Variables Переменные	Obs Наблюдения	Mean Среднее	Std. Dev. Стандартное отклонение	Min	Max
Income/Доход		22353,04	35929,37	0	960000
Internet usage frequency Частота использования Интернета		1,862008	1,412295	1	5
Gender/Пол		1,510808	0,4999572	1	2
Age/Возраст		62,45336	4,256126	55	70
Age^2/Возраст в квадрате	3,377	3918,532	532,4995	3025	4900
Health status/Состояние здоровья		3,068996	1,080433	1	5
Education level/Уровень образования		3,903761	2,335952	1	13
Marital status/Семейный статус		0,8072253	0,394536	0	1
Number of children/Количество детей		1,989636	1,09699	0	8
Live in urban or rural/Место проживания		1,421676	0,4939004	0	1
Depression level/Уровень депрессии		3,73971	1,030087	1	5

Data source: the author's calculations based on data presented in Chinese Social Survey 2017 (CGSS-2017).
Источник данных: расчеты авторов по данным китайского социального исследования 2017 г. (CGSS-2017).
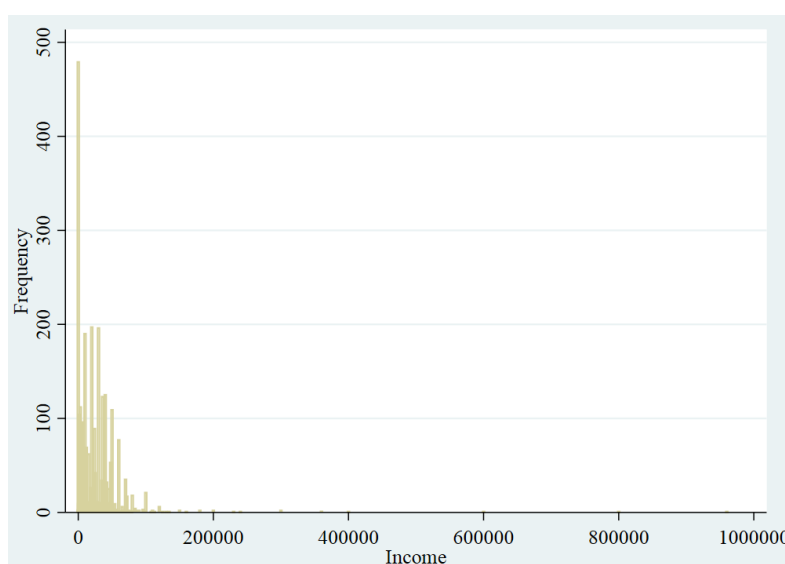
Data source: the author's visual description of the Poisson distribution of the existing data using Stata statistical software.
Источник данных: авторская визуализация распределения Пуассона для имеющихся данных с использованием статистического программного обеспечения Stata.

Fig. 3 *Poisson distribution of dependent variable «Income»*
Рис. 3. *Распределение Пуассона для зависимой переменной «Доход»*

Assuming that the independent variable xi is a nonnegative integer, the probability of occurrence of dependent variable y_i is expressed as:

$$P(Y_i = y_i | x_i) = \frac{\exp(-\lambda_i)\lambda_i^{y_i}}{y_i!}. \tag{1}$$

In formula (1), y_i=0,1, 2, ... n , λ_i known as the Poisson arrival rate, determined by the explanatory variable x$_i$. Since the mean and variance of Poisson are equal, and the mean is equal to λ_i, formula (2):

$$E(Y_i|x_i) = Var(Y_i|x_i) = \lambda_i = exp(\beta x_i) .\qquad(2)$$

Since the Poisson distribution is completely determined by its mean, adding the independent and control variables can be expressed as the formula (3):

$$exp(\beta_i x_i) = exp(\beta_0 + \beta_1 internrt_i + \beta_2 gender_i + \beta_3 martial_i + \beta_4 education_i +$$
$$+ \beta_5 estate_i + \beta_6 investment_i + \beta_6 children_i + \beta_7 isurban_i + \beta_6 depression_i)\quad(3)$$

In formula (3), β_i is the regression coefficient corresponding to the explanatory variable x_i. $exp(\beta_i x_i)$ is called Incidence Rate Ratio (IRR), which indicates that when x_i increases by one unit (from x_i to x_{i+1}), the average number of occurrences of the dependent variable will be how many times the original.

Empirical analysis and results report

Regression analysis

First, we use the Ordinary Least Squares (OLS) model for baseline regression. The results show that (Table 2) independent variables and most control variables are significant. Then we use Poisson regression model for robust standard error regression analysis. The results show (Table 2) that the independent variable «Internet usage frequency» and other control variables are within the 95 % confidence interval except the square of age and age.

Table 2. *Comparison of OLS regression and Poisson regression*
Таблица 2. *Сравнение регрессии методом наименьших квадратов и регрессии Пуассона*

Variables Переменные	OLS regression Регрессия методом наименьших квадратов			Poisson regression Регрессия Пуассона		
	Coef.	t	P>|t|	Coef.	z	P>|z|
Internet usage frequency Частота использования Интернета	3657,766	6,98	0,000	0,097	6,530	0,000
Gender/Пол	4056,656	4,22	0,000	0,229	5,240	0,000
Age/Возраст	2667,064	0,83	0,405	−0,029	−0,220	0,826
Age²/Возраст в квадрате	−18,901	−0,75	0,451	0,000	0,300	0,765
Health status/Состояние здоровья	1215,980	2,39	0,017	0,078	3,180	0,001
Education level/Уровень образования	4097,572	10,36	0,000	0,113	13,000	0,000
Marital status/Семейный статус	2249,792	2,41	0,016	0,154	2,980	0,003
Number of children/Количество детей	−2422,459	−7,4	0,000	−0,190	−8,540	0,000
Live in urban or rural/Место проживания	−9231,429	−11,95	0,000	−0,717	−15,19	0,000
Depression level/Уровень депрессии	−1851,234	−3,87	0,000	−0,095	−3,950	0,000

In order to compare the difference between OLS regression and Poisson regression, we output the results to Table 3.

The frequency of Internet use has a significant positive correlation with the labor income of the «young» elderly, that is, the higher the digital literacy of the «young» elderly, the higher the labor income. Therefore, Hypothesis 1 proposed by the author holds. The gender, health status, education level, marital status and other personal characteristics of the «young» elderly cause differences in the frequency of Internet use, and are significantly positively correlated with labor income. Therefore, Hypothesis 2 proposed by the author holds. The family size of the «young» elderly affects their Internet use, showing a negative correlation in general. Therefore, Hypothesis 3 proposed by the author holds. There are significant differences in the frequency of Internet use between urban and rural young people, which leads to the ur-

ban elderly are more likely to use their own digital literacy higher income. Therefore, Hypothesis 4 proposed by the author holds.

Table 3. *Comparison of OLS regression and Poisson regression results*
Таблица 3. *Сравнение результатов регрессии методом наименьших квадратов и регрессии Пуассона*

Variables Переменные	OLS Метод наименьших квадратов	Poisson regression Регрессия Пуассона
Internet usage frequency Частота использования Интернета	3074,2*** (−5,16)	0,0881*** (−5,25)
Gender/Пол	3384,1***(−3,45)	0,207*** (−4,75)
Age/Возраст	1371,8 (−0,43)	−0,0745 (−0,56)
Age^2/Возраст в квадрате	−8,549 (−0,34)	0,000684 (−0,65)
Health status/Состояние здоровья	1113,3* (−2,26)	0,0721** (−3,06)
Education level/Уровень образования	3929,6*** (−9,86)	0,109*** (−12,5)
Marital status/Семейный статус	2326,5* (−2,56)	0,149** (−2,89)
Number of children/Количество детей	−2275,6***(−6,86)	−0,187*** (−8,30)
Live in urban or rural/Место проживания	−8968,7***(−11,67)	−0,715*** (−15,12)
Depression level/Уровень депрессии	−1663,4***(−3,44)	−0,0909*** (−3,76)

t statistics in parentheses, $p<0,05$, $**p<0,01$, $*** p<0,001$.
В скобках указана t статистика, $*p<0,05$, $**p<0,01$, $*** p<0,001$.

In order to better explain the effect of independent variables on dependent ones, we calculated the incidence-rate ratio (IRR) of Internet use frequency on the labor income of the «young» elderly, and the results are shown in Table 4.

Table 4. *IRR of Internet usage frequency on labor income of the «young» elderly*
Таблица 4. *Коэффициент зависимости между частотой использования Интернета и трудовыми доходами «молодых» пожилых людей*

Variables Переменные	IRR Внутренняя норма доходности	Robust Std.Err Надежная стандартная ошибка	z	P>|z|	95 % Conf. Interval 95%-й доверительный интервал	
					Low Нижняя оценка	High Верхняя оценка
Internet usage frequency Частота использования Интернета	1,102	0,016	6,530	0,000	1,070	1,135
Gender/Пол	1,258	0,055	5,240	0,000	1,154	1,371
Age/Возраст	0,971	0,129	−0,220	0,826	0,749	1,259
Age^2/Возраст в квадрате	1,000	0,001	0,300	0,765	0,998	1,002
Health status/Состояние здоровья	1,081	0,026	3,180	0,001	1,030	1,134
Education level/Уровень образования	1,120	0,010	13,000	0,000	1,101	1,139
Marital status/Семейный статус	1,166	0,060	2,980	0,003	1,054	1,290
Number of children/Количество детей	0,827	0,018	−8,540	0,000	0,792	0,864
Live in urban or rural/Место проживания	0,488	0,023	−15,19	0,000	0,445	0,535
Depression level/Уровень депрессии	0,909	0,022	−3,950	0,000	0,867	0,953

Table 4 shows: (1) For every unit increase of Internet use frequency of the «young» elderly, their labor income grows by 10,2 %; (2) men of the «young» elderly have 25,8 % higher labor income than women; (3) for each unit of health improvement of the «young» elderly, their labor income increased by 8,1 %; (4) for each unit increase in education, its labor income will increase by 12 %; (5) stable marital situation makes the labor income of the

«young» elderly 16,6 % higher than unmarried one; (6) for each additional child in the families of the «young» elderly, their labor income decreased by 17,3 %. According to the China Aging Center, more than 60 percent of elderly retirees in China undertake the task of helping their children and care for their children at home. Perhaps it is this reason that leads to the more children, hindering the labor participation of the elderly; (7) «young» elderly living in cities have 51,2 % higher labor income than the ones in rural areas. This may be related to the abundance of jobs in the city; (8) for every unit increase in the mental depression burden of the «young» elderly, their labor income decreased by 9,1 %. The mental health of the elderly is worthy of attention and further research.

Analysis of the robustness

In order to verify the robustness of the model, this paper uses the survey item in CGSS2017 data coding table «in your week's work, what is the proportion of using the Internet?» (named «Proportion of work online»), replacing the independent variable «Internet use frequency» selected above with OLS regression and Poisson regression. The regression results from Table 5 show that all five hypotheses are valid, and the independent variables and control variables are basically consistent with Table 5. This model is very robust.

Table 5. *Robust regression analysis of replacing independent variables*
Таблица 5. *Устойчивая регрессия замены независимых переменных*

Variables Переменные	OLS regression Регрессия методом наименьших квадратов	Poisson regression Регрессия Пуассона
Proportion of work online/Доля онлайн-занятости	661,8* (2,37)	0,00763* (2,49)
Gender/Пол	3364,5*** (3,37)	0,212*** (4,6)
Age/Возраст	4258,0 (1,25)	0,012 (0,09)
Age^2/Возраст в квадрате	−31,85 (−1,20)	−0,0000305 (−0,03)
Health status/Состояние здоровья	1442,1** (2,77)	0,0858***(3,41)
Education level/Уровень образования	4915,0*** (10,83)	0,135*** (14,77)
Marital status/Семейное положение	2158,6* (2,20)	0,163** (2,96)
Number of children/Количество детей	−2871,3*** (−7,87)	−0,217*** (−8,90)
Live in urban or rural/Место проживания	−10627,4*** (−12,72)	−0,760*** (−15,46)
Depression level/Уровень депрессии	−2066,8*** (−4,17)	−0,110*** (−4,33)

*t statistics in parentheses, *p<0,05, **p<0,01, *** p<0,001.*
*В скобках указана t статистика, *p<0,05, **p<0,01, *** p<0,001.*

Heterogeneity analysis
Heterogeneity of educational attainment

In order to distinguish the digital literacy differences formed by different educational levels of the «young» elderly, we divided the educational level of the «young» elderly into 13 levels, and carried out Poisson regression verification. The regression results from Table 6 showed that the independent variables and control variables remained significant within the 95 % confidence interval, with 11 different levels of education, except for illiteracy and literacy levels, having a significant impact on labor income (P=0,000); in general, the higher the education level is, the higher the personal labor income is. The labor income of the «young» elderly with master's degree and above is 3,47 times higher than that of the «young» elderly with primary school education. This suggests the authors' hypothesis 5 holds.

Table 6. Analysis of educational heterogeneity
Таблица 6. Анализ неоднородности по уровню образования

Variables/Переменные	IRR Внутренняя норма доходности	P>|z|
Internet usage frequency/Частота использования Интернета	1,104	0,000
Education level/Уровень образования		
(1) literay class/основы грамотности	0,971	0,926
(2) primary school/начальная школа	1,392	0,000
(3) junior high school/неполное среднее образование	2,006	0,000
(4) vocational high school/профессиональная средняя школа	5,691	0,000
(5) normal high school/ полное среднее образование	2,413	0,000
(6) technical secondary school/профессиональное училище	2,827	0,000
(7) technical school/техникум	2,932	0,000
(8) college (adult higher education)/колледж	3,220	0,000
(9) college (formal higher education)/колледж (высшее образование)	3,996	0,000
(10) undergraduate (adult higher education)/бакалавриат	3,033	0,000
(11) undergraduate (formal higher education)/бакалавриат (высшее образование)	4,888	0,000
(12) Master's degree and above/магистратура и выше	4,862	0,000

Residence heterogeneity

In order to verify the impact of digital literacy differences between urban and rural elderly on the labor income of the «young» elderly, this paper divides the sample data into «urban group» and «rural group». We performed Poisson regression on these two sets of data separately. According to the regression results in Table 7, for every one unit increase in the frequency of Internet use of the «young» elderly living in cities, their labor income will increase by 9 %. The labor income of the «young» elderly living in rural areas will increase by 20,4 % when the frequency of Internet use increases by 1 unit. This shows that the improvement of digital literacy has more significant impact on the labor income of rural «young» elderly. It also confirms that there is a large «digital divide» between urban and rural areas in China.

Table 7. Analysis of residence heterogeneity
Таблица 7. Анализ неоднородности места проживания

Variables Переменные	Urban/Городские жители		Rural/Сельские жители	
	IRR/Внутренняя норма доходности	P > |z|	IRR/Внутренняя норма доходности	P > |z|
Internet usage frequency Частота использования Интернета	1,090	0,000	1,204	0,000
Gender/Пол	0,824	0,000	1,570	0,000
Age/Возраст	0,968	0,832	1,007	0,976
Age^2/Возраст в квадрате	1,000	0,762	1,000	0,971
Health status/Состояние здоровья	1,046	0,118	1,217	0,000
Education level/Уровень образования	1,116	0,000	1,144	0,000
Marital status/Семейный статус	1,147	0,019	1,294	0,008
Number of children/Количество детей	0,768	0,000	0,972	0,421
Depression level/Уровень депрессии	0,922	0,003	0,871	0,001

Analysis of regional heterogeneity

According to the regression results in Table 8, digital literacy has a significant positive correlation for the labor income of «young» elderly people in eastern, central and western

China, but there are spatial differences in different regions. Among them, for each unit increase in the Internet use frequency, the labor income of the eastern, central and western elderly will increase by 8,5 %, 7,9 % and 14,4 % respectively. The reason for this phenomenon is that the digital literacy of residents in the eastern and central provinces have relatively high economic development level, so the income effect of digital literacy on the «young» elderly in the eastern and central regions is lower than that in the western ones, and the economic development level of the western provinces is relatively low, and the digital literacy of their residents is generally relatively low, which leads to a more significant return on labor for the young elderly in the west. This reflects that the digital literacy of Chinese residents is still «high in the east and low in the west», and the regional «digital divide» phenomenon objectively exists in China. This proves the authors' hypothesis 6 holds.

***Table 8.** Analysis of regional differences*
***Таблица 8.** Анализ региональных различий*

Variables Переменные	East Восток		Central regions Центральные районы		West Запад	
	IRR Внутренняя норма доходности	P > |z|	IRR Внутренняя норма доходности	P > |z|	IRR Внутренняя норма доходности	P > |z|
Internet usage frequency Частота использования Интернета	1,085	0,000	1,079	0,004	1,144	0,001
Gender/Пол	1,273	0,000	1,329	0,000	1,318	0,009
Age/Возраст	1,209	0,267	0,663	0,109	0,835	0,544
Age^2/Возраст в квадрате	0,999	0,278	1,003	0,102	1,001	0,537
Health status/Состояние здоровья	1,014	0,671	1,167	0,000	1,235	0,000
Education level/Уровень образования	1,103	0,000	1,179	0,000	1,121	0,000
Marital status/Семейный статус	1,119	0,050	1,266	0,008	1,056	0,804
Number of children/Количество детей	0,826	0,000	0,873	0,000	0,985	0,788
Live in urban or rural/Место проживания	2,350	0,000	1,505	0,000	1,715	0,000
Depression level/Уровень депрессии	0,928	0,009	0,926	0,053	0,907	0,314

Analysis of the interaction terms

Individual ideas and behaviors are usually limited by their own knowledge and cognitive level, and the degree of education is an important standard to measure individual cognitive level and learning ability. The cognitive level and ability to accept new things of elderly people are different, and the proficiency of Internet use is not the same. Therefore, the difference in educational level will affect whether they use the Internet, thus affecting the employment participation of the elderly. This paper analyzes the interaction between the Internet and the educational level of the elderly, and the regression results are shown in Table 9. The regression results show that the interaction coefficient between Internet use and educational level is significantly positive at the level of 1 %, indicating that Internet use has different effects on the labor income of the «young» elderly with different educational levels. This further proves the correctness of Hypothesis **5** of the authors and also indicates that the model is stable.

On the one hand, economically developed regions have more employment opportunities than underdeveloped ones, and their wage levels are relatively high; on the other hand, the differences in Internet access rate, network speed, price and service between different regions have resulted in differences in the construction level of digital infrastructure between different regions, thus affecting the Internet use frequency of the «young» elderly in different regions.

Therefore, under the joint influence of these two aspects, the digital literacy of residents between regions has obvious differences, and ultimately reflects the difference in labor income. This paper analyzes the interaction between the Internet and the residence of the «young» elderly, and the regression results are shown in Table 9. The regression results show that the interaction coefficient between the frequency of Internet use and the place of residence is significantly positive at the level of 1 %, indicating that the frequency of Internet use is different for the labor income of the young elderly living in different regions. This further proves the correctness of the authors' hypothesis **6**, and again shows that the model is stable.

Table 9. *Interaction analysis of internet usage frequency, education and residence*
Таблица 9. *Анализ взаимосвязи между частотой использования Интернета,
уровнем образования и местом проживания*

Variables Переменные	Internet usage frequency interacts with education level Взаимосвязь частоты использования Интернета с уровнем образования		Internet usage frequency with residence interaction Взаимосвязь частоты использования Интернета с местом проживания	
	IRR Внутренняя норма доходности	P>|z|	IRR Внутренняя норма доходности	P>|z|
Interactive term Показатели взаимосвязи	1,010	0,000	1,084	0,000

Conclusion

In the digital economy era, digital literacy has become the basic survival skills and essential literacy of citizens. China aging population is becoming more and more serious; re-employment of retired elderly people is inevitable. This paper uses the data of CGSS2017 to verify the impact of digital literacy on the labor income of the «young» elderly and confirms the positive impact. The heterogeneity analysis shows that the digital divide leads to differences in the labor income of the «young» elderly with different education levels and regions, and the following suggestions are put forward:

1. Government. The first is to improve policy support and institutional supervision on digital equality, anti-discrimination, digital relief and lifelong education for the elderly, so as to clear obstacles to the digital divide in re-employment of the «young» elderly; second, improve the rural infrastructure construction, bridge the digital gap between urban and rural areas in terms of infrastructure, and comprehensively improve the digital skills of the rural «young» elderly, so as to promote the development of digital economy to serve the continuous improvement of income of the rural «young» elderly; the third is to build a digital literacy education framework from the perspective of lifelong learning, strengthen the digital literacy education of the «young» elderly, and narrow the labor income gap of the «young» elderly by improving the quality of digital literacy for the «young» elderly.

2. Market. Promote the aging transformation of digital tools, and narrow the digital gap between the «young» elderly and other age groups of society. It is suggested to fully consider the use needs of the «young» elderly, accelerate the aging adaptation 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. Social aspects. Actively create a digital friendly society. Actively integrate community resources, relying on community cultural activities center to carry out a variety of digital

ability and literacy education activities, and actively play the role of community workers, volunteers and peer groups, and actively help the young elderly to improve digital literacy.

4. Family aspects. Improve family digital feedback, 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 young elderly in using new media, and drives это же предложения the «young» elderly to better adapt to digital life.

5. In terms of the «young» elderly, they should overcome the old-fashioned ideas, update concepts, actively learn various information technologies and knowledge, cross the digital divide and fully integrate into the digital economy.

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ВЛИЯНИЕ ЦИФРОВОЙ ГРАМОТНОСТИ
НА ТРУДОВЫЕ ДОХОДЫ «МОЛОДЫХ» ПОЖИЛЫХ ЛЮДЕЙ:
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Актуальность. Ускоренное демографическое старение в современном мире происходит на фоне быстрого развития цифровой экономики. В последние годы наличие определенного уровня цифровой грамотности все чаще становится для пожилых людей базовым качеством, определяющим перспективы сохранения ими после выхода на пенсию трудовой активности, а также привычного уровня и качества жизни. В связи с этим представляется важным изучение международных кейсов, отражающих влияние цифровой грамотности на трудовые доходы т. н. «молодых» пожилых людей – граждан, недавно достигших границы трудоспособного возраста, позволяющего им выйти на пенсию. В статье описывается опыт Китая в этой сфере. Цель: изучить влияние цифровых компетенций на доходы граждан Китая, недавно достигших пенсионного возраста, и предложить рекомендации по их развитию в интересах всех стейкхолдеров данного процесса: государства, работодателей, местного социума, самих пожилых людей и членов их семей. Методы. Анализируется теоретическая концепция цифровой грамотности пожилых людей и механизм ее воздействия на трудовой доход представителей этой социальной группы. С помощью метода регрессии Пуассона на основе китайского социального исследования 2017 г. (CGSS-2017) проведен эмпирический анализ влияния цифровой грамотности на трудовые доходы пенсионеров. Результаты. Подтверждается положительное влияние цифровой грамотности на трудовые доходы «молодых» пожилых людей, доказано воздействие цифрового разрыва у работников различных возрастных групп на трудовые доходы (с учетом уровня образования и места проживания). Выводы. Сохранение трудовой активности пожилых за счет развития их цифровых компетенций важно не только для увеличения личных доходов и перераспределения семейных бюджетов между представителями различных поколений. Это не менее важно для макроэкономики, поскольку занятость пожилых позволяет сократить дефицит рабочей силы на рынке труда, обусловленный изменением возрастного профиля трудоспособного населения на фоне глобального старения. Сохранение трудовой активности человека после достижения границы трудоспособного возраста увеличивает налоговые поступления в бюджет, снижает государственные расходы на дополнительные социальные выплаты пожилым людям с низкими доходами, сокращает зависимость индивида и домашних хозяйств от социальных пенсий. Не менее важны и социальные выгоды от сокращения цифрового разрыва у представителей различных поколений. Выдвигаются конкретные предложения по повышению цифровой грамотности «молодых» пожилых. Для этого рекомендуется развитие системы «пять в одном», основными

субъектами которой являются государственные структуры, работодатели, локальный социум, пожилые люди и члены их семей.

Ключевые слова: *Цифровая грамотность, цифровая экономика, цифровой разрыв, «молодые» пожилые, трудовые доходы.*

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