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PAPER

Future of Work: Working from Home. Empirical Evidence from the Chinese Economy

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ABSTRACT

The present analysis elucidates the estimates of the proportion of the non-agricultural workforce that can potentially work from home (WFH) in China. The current analysis explains the estimates of China's non-agricultural workforce's ability to WFH to address the inadequate research on remote work adaptability in emerging economies. The considerable demographic and regional disparities in WFH potential we found are noted here. To measure the possibility of WFH, our empirical outcomes revealed that the probability of working remotely from home is higher for youth and middle-aged workers residing in urban areas and belonging to nuclear families. Education is observed to strongly interconnect with working remotely—individuals with higher education are more likely to WFH. In addition, workers working in white-collar occupations have a higher probability of WFH than those in lower-skilled occupations. Further investment in developing information and communication technology (ICT) infrastructure in the economy to improve the productivity of the country's workforce is an essential area of policy action that emerges from the analysis.

KEYWORDS

COVID-19, China, work from home (WFH), labor policy

1 INTRODUCTION

Working from home (WFH) refers to workers or employers performing their responsibilities outside of their office. "Working remotely from home" refers to using digital technologies for communication and cooperation to complete employment duties from home rather than commuting. It lets professionals operate from home while keeping the same level of responsibility as in an office. This place can be an employee's home, a co-working or other shared space, a private office, or any location other than the usual corporate office building. [1] Recently, it has become the most approved possibility as it assists businesses and individuals. It has also been an important consideration after the COVID-19 pandemic, which drove firms from traditional work environments to completely remote workforces for

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employers' safety. [2]. Even though remote work tends to drop in contrast to when the pandemic was at its peak, companies found that lessening the size of their office would cut down their operational costs. So, it's more probable that there will be more remote work after the pandemic. [3], [4]. But the main issue with WFH after a pandemic is trying to ascertain the optimal number of days for both employers and employees [5].

Many factors are related to the economics of WFH, including the measurement of WFH. [6], the heterogeneous effect of WFH on different workers [4], [7], [8], the productivity at WFH jobs [9], firms' decisions on work-from-home policy [10], and theoretical models of work-from-home [11]. Also, some studies review the general impact of COVID-19 on labor markets and how WFH can affect the general structure of labor supply and labor demand. [12], [13], [14].

As the current COVID-19 pandemic drives a review of our accepted work patterns, WFH is one of the most critical and significant issues. In many countries, remote working was generally adopted as a conclusion to the challenges posed by social distancing, such as avoiding contact in the workplace and using public transportation [15]. Contrary to many other measures, WFH gains global applause in the media. Indeed, studies have also revealed that not WFH is a significant risk factor for contracting COVID-19. Empirical evidence suggests that a one percentage point increase in WFH would significantly reduce the infection rate in most of the economies in the world. Moreover, the experience during the pandemic set off political debates on whether employees should generally have the legal right to WFH if reasonably practicable [16]. Therefore, it is more probable that WFH will be supported by the labor policy agenda as a desired job option for some employees when the pandemic ends [17].

It is thus foremost to realize who has the chance to WFH and which potential factors correspond with work-from-home [3], [8]. Is remote working an advantage of specific occupational groups, or can it be spread as a flexible work arrangement that benefits employees most in need of flexible working? The evidence preceding the pandemic shows that the highly educated and top earners and incumbents of certain occupations were more likely to be permitted to WFH. Remote working may not be possible for all employers, but it can be presumed that parents with care obligations are likely to use this option. Therefore, it is predominant to re-assess the significance of occupations or job characteristics on the one hand and family or household arrangements on the other for the propensity of WFH. Education, occupational status, and gender are the main factors that affect WFH. Using data from the self-administrative survey through emails, this study examines which household and employment-related characteristics are primarily associated with individuals WFH during and after the pandemic.

The study is assembled as follows: Section 2 will review the prior literature. Section 3 will cover data and methodology. Section 4 will include discussions. We concluded the study and confabulated a few policy insights for China.

2 LITERATURE REVIEW

[18] demonstrate that productivity tends to increase while WFH. Personal and technology-related factors affect productivity positively. [19] illustrate that when the analysis takes evidence from Malaysia, employers' productivity is enhanced due to the positive impact of the workplace environment and employer motivation.

[4] explain that in the context of Italian employers, WFH contributes to accelerating productivity because it is the only option available to combat the risk. [20] analyze that in the US, WFH plays a significant role in increasing productivity. [21] examines that depending on education, tenure, and use of computers, men have a higher probability of WFH than women in the context of German employers. [13] find out that in the case of 20 countries, WFH aided in enhancing productivity. [21] describes how flexible working hours function as a contributor to productivity. [22], [23] reveal that the length of employment and job satisfaction were the most significant determinants of work performance. For this, the analysis took evidence from Indonesia.

[24] Describe that in the case of Japan, close communication with superiors, refraining from working long hours, and obtaining adequate sleep may boost the work engagement of employees WFH. [1], [25] Clarify that most people had a more positive experience of WFH. Moreover, work-life balance, improved work efficiency, and greater control tend to improve productivity. [26] Indicate that WFH and job satisfaction are positively correlated. [27] The analysis finds that IT training, digital infrastructure, and management support are the leading indicators affecting workers' productivity. It has taken evidence from Indonesia for this. [25] Analyze that WFH causes an increase in workload for all participants by three hours per week and a loss of productivity for 38% of participants. Moreover, technical issues are the main reasons for decreased productivity. [28] Conclude that firms should implement different policies to strengthen WFH. These policies include meetings with supervisors and time spent on coordination activities.

[22] Explain that there is a negative relationship between WFH and employers' physiological well-being and productivity. [29] WFH is vital in mitigating personal performance and productivity. [30] Interpret that when the analysis takes the evidence from 20 Australian organizations, there is a positive interconnection between organizational, job-related factors and work-from-home employees' satisfaction, affecting productivity. [31] Illuminate that remote work altered responsibilities. The demand for working parents in the United States has significantly increased. [7] Conclude that mental health tends to deteriorate over the COVID-19 pandemic. Moreover, there is a decline in the number of women compared to men. [3] Explain that the gender composition of an occupation is an important factor for WFH. The study has taken the case of Germany. [10] WFH has a significant positive impact on productivity. Jones and Manhique demonstrated that digital labor platforms have grown fivefold over the last decade, enabling significant expansion in gig work worldwide. These trends are evident across multiple market segments, including female-dominated professions, suggesting digital labor markets can help workers adjust to economic shocks in low-income contexts.

Based on insights from prior literature, the present study intends to explore the essential factors interconnected with WFH in the Chinese economy. It will consider the significant household and individual factors associated with working from home.

3 DATA AND METHODOLOGY

To analyze the WFH situation in China. We have conducted an online survey. We have followed the following steps. First, we constructed a questionnaire based on different reports and literature reviews. After that, we emailed the questionnaire to

people in other occupations. We have ensured that the information obtained must be authentic to get rigorous results for policy insights. A detailed description of the variables is provided in Table 1.

The research also implements a multivariate analysis to determine the central socio-demographic features affecting the capability to WFH using ICT tools. [32], [33], [34], [35], [36], [37], [38], [39]. The following logistic regression model is estimated:

$$WFH = \alpha_0 + \alpha_1 X_i + \mu_i$$

Where the dependent variable is WFH_i, it is a binary variable taking the value one if the employed individual can work remotely from home, proxied by the ability to use computers, and 0 otherwise. *X*i represents a vector of worker-level characteristics, which includes age group, gender, educational attainment, and occupation, as well as household-level factors such as family type, region of residence, and household consumption expenditures. It is relevant to identify here that the logit or probit estimation technique is generally employed where the dependent variable is binary. This technique is selected over other techniques, such as the linear probability model (LPM) or the Tobit model. [40] The LPM is a simple but inaccurate and narrow-scoped method, whereas the Tobit approach is usually employed in estimating models with censored dependent variables.

Table 1. Essential indicators of employed sample

Variables	Measurement
Dependent Variable	
Work from home (WFH)	All those who are employed 15 years of age and above who used a desktop, laptop, tablet, or other devices, 0 otherwise
Independent Variables	
Individual characteristics	
Age_1	Employed in the age group of 15–29 years
Age_2	The age group of 30–45 years
Age_3	The age group of 46–60 years (age 60 years and above, reference category)
God	Male = 1, 0 otherwise (female, reference category)
Married	Ever married = 1, 0 otherwise (unmarried reference category)
Household Characteristics	
Cons	Household monthly consumption in US dollars.
Nuc_fam	Nuclear family = 1, 0 otherwise (joint family, reference category)
Urb	Urban areas = 1, 0 otherwise (rural, reference category)
Educational level	
Prim	Primary include (classes 1 to 6 years of schooling) = 1, 0 otherwise
Lower sec	Lower secondary = 1, 0 otherwise
Upper sec	Upper secondary = 1, 0 otherwise
Degre	University degrees = 1, 0 otherwise (No formal education, reference category)

(Continued)

Table 1. Essential indicators of employed sample *(Continued)*

Variables	Measurement
Occupational Groups	
Legis	Legislators and senior managers = 1, 0 otherwise
Prof	Professionals = 1, 0 otherwise
Clear	Clerk = 1, 0 otherwise
Serv	Service worker = 1, 0 otherwise
Craft	Craft Workers = 1, 0 otherwise
Plan	Plant Workers = 1, 0 otherwise
Tech	Technicians' occupations = 1, 0 otherwise, (Elementary, reference category)
Employment Status	
Less ten employees	Employer employing < 10 employee = 1, 0 otherwise
above ten employees	Employer employing > 10 employee = 1, 0 otherwise
Paid	Paid employees = 1, 0 otherwise (self-employed, reference category)

Source: Survey data was collected from the authors.

4 SUMMARY STATISTICS

The summary statistics of the sample of employed individuals who can WFH and those who cannot, based on their ability to use computers employed in the econometric analysis, are presented in Table 2. There is a statistically significant difference in the socio-economic features between the two sets of samples, as indicated by the two-sample t-test (last column of Table 2). Age-wise, the youth aged 15–29 years and the middle-aged (30–45 years) constitute a substantial portion of the employed, both among the sample who can WFH and those who cannot. Gender-wise, males comprise the critical majority of the portion employed for both categories of employed. In terms of marital status, married individuals comprise the sample's central portion. However, this share was significantly lower for employees who can WFH compared to their counterparts who cannot work remotely. It is seen that the average monthly household consumption of individuals who can WFH is nearly twice that of their counterparts who cannot work remotely using computers. Another significant difference is seen between the two samples associated with the region of residence, with the substantial portion of employed who used computers residing in urban areas, while the majority of employed who did not use computers observed to be living in rural areas.

Significant differences are present in educational attainment between the two sets of samples. Most individuals who can WFH have a degree level of education, while those who have professional degrees. Furthermore, a notable portion of employed people who cannot WFH have no formal education, with the majority of respondents having educational attainment of lower and upper primary education. There are also noticeable differences in the occupational structure of the two samples, with a more significant portion of white-collar jobs among the individuals who can WFH and a higher consideration in low-skill occupations among those who cannot work remotely using computers. The analysis by employment status shows

that most individuals are working as paid employees across both sets of samples. In contrast, a higher share of employed people who cannot WFH are self-employed compared to their counterparts who can work remotely.

Table 2. A quick look at the summary of the work from home survey

Variable	WFH		Cannot WFH		T-Test
	Mean	Std. Dev.	Mean	Std. Dev.	
Individual characteristics					
Age_1	0.43	0.48	0.41	0.48	–5.526***
Age_2	0.42	0.48	0.36	0.47	–1.446
Age_3	0.13	0.36	0.2	0.4	5.301***
Age_4	0.02	0.14	0.03	0.19	4.560***
Gnd_ m	0.84	0.38	0.90	0.35	3.121**
Gnd_f	0.16	0.38	0.10	0.35	–3.121**
Marr	0.35	0.47	0.25	0.44	–9.707***
Un_marr	0.65	0.47	0.75	0.44	8.040***
Household Characteristics					
Cons	1200	800	1800	800	46.216***
Nuc_fam	0.55	0.5	0.57	0.5	6.727***
Urb	0.76	0.43	0.49	0.5	–27.331***
Rur	0.24	0.43	0.51	0.5	27.321***
Educational level					
No Formal Education	0.07	0.27	0.36	0.48	27.513***
Prim	0.01	0.09	0.05	0.22	10.064***
Lower sec	0.1	0.3	0.3	0.46	21.137***
Upper sec	0.40	0.45	0.20	0.42	–7.755***
Degre	0.42	0.49	0.09	0.25	–57.434***
Occupational Groups					
Legis	0.15	0.32	0.02	0.13	–28.334***
Prof	0.33	0.47	0.07	0.26	–41.089***
Cler	0.12	0.32	0.04	0.18	–19.918***
Serv	0.11	0.31	0.02	0.14	–23.630***
Craf	0.11	0.36	0.23	0.43	9.426***
Plan	0.1	0.3	0.25	0.42	16.054***
Tech	0.04	0.2	0.11	0.32	12.628***
Ele	0.04	0.21	0.26	0.44	22.250***

(Continued)

Table 2. A quick look at the summary of the work from home survey *(Continued)*

Variable	WFH		Cannot WFH		T-Test
	Mean	Std. Dev.	Mean	Std. Dev.	
Employment Status					
Less ten employees	0.02	0.14	0.01	0.1	–5.163***
above ten employees	0.02	0.13	0.01	0.06	–9.718***
Self	0.11	0.34	0.19	0.41	8.387***
Paid	0.85	0.37	0.79	0.42	–5.344***
No. of observations	400		400		

Notes: *Significant at 10% level, **significant at 5%, ***significant at 1% level of significance.

5 RESULTS

The outcome of the logistic regression model evaluated for highlighting the major socio-economic features influencing the capability to WFH using ICT techniques is presented in Table 2. The marginal effects or probability derivative presented in the last column of the table specify the change in probability on account of a one-unit change in an independent variable.

The results show that in connection to the reference category of individuals aged 61 years and above, the employed individuals in lower age brackets have a higher probability of WFH, with the effect being statistically insignificant for individuals aged 46–60. The employed youth are more likely to WFH, while middle-aged individuals (30–45 years) are also more likely to WFH. Analysis from [41] indicates a higher likelihood of working at home for workers aged over 41 years across 23 Latin American and Caribbean countries, while [42] finds a lower probability of individuals over 40 working remotely from home. The results about gender indicate that males are more likely to WFH than females.

Regarding marital status, the analysis's outcome disclosed that, compared to the reference category, unmarried, married individuals have a significantly lower probability of WFH. It is noticed that the household economic status, illustrated by the monthly household consumption expenses, tends to be a vital factor in the capability to work remotely using computers, which is positively related to the use of computers. This finding is intuitive, as well-off households are more likely to have resources to have computers at home. Saltieland, the individuals in that household may also be engaged in higher-skilled jobs that require using ICT equipment, such as computers, on a routine basis. Compared to their rural counterparts, the employed living in urban areas have a six percent higher likelihood of WFH using computers. Individuals living in a nuclear family structure are 22 percent more likely to use computers and work from home.

The results reveal that the capability of WFH is strongly affected by employment's educational acquisition. When compared to the reference category of no formal education, the probability of working remotely using computers rises monotonically with successively higher levels of education, with individuals having secondary levels of education, degree, and professional degree qualification being 0.004 percent, 0.043 percent, and 0.126 percent more likely to WFH, respectively. The existing body of evidence supports this result. [1], [41], [42] This reveals that education substantially affects the ability to WFH across advanced and developing economies.

The outcome about occupational groups shows that individuals in white collar jobs have a greater probability of WFH, as compared with those employed in the top two occupational categories of legislators, senior officials, and professionals, having 17 percent and 10 percent greater likelihood of working remotely in comparison to the reference group of elementary occupations. Among the blue-collar occupations, clerical workers are observed to have a 17 percent higher likelihood of working remotely using computers. These findings concerning occupational categories are consistent with other studies in this domain as presented in [1]. That indicates higher WFH ability for white collar jobs across low and middle-income countries.

The results regarding employment status show that paid employees and employers are more likely to work remotely, and this is statistically significant.

Table 3. Results of the logit model

	Coefficients	Std. Err.	z-Statistics	Marginal Effects
Age_1	1.132	0.201	5.61***	0.045
Age_2	0.682	0.195	4.02***	0.029
Age_3	0.124	0.200	1.42	0.010
Gnd	0.664	0.081	6.56***	0.015
Married	–0.499	0.072	–5.00***	–0.013
Cons	1.104	0.056	19.83***	0.037
Urb	0.699	0.056	12.62***	0.024
Nuc_fam	0.222	0.055	3.31***	0.006
Prim	–0.639	0.252	–2.54***	–0.017
Lower sec	0.680	0.102	1.18	0.004
Upper sec	0.716	0.090	10.90***	0.043
Degre	1.810	0.098	18.52***	0.126
Legis	2.016	0.144	14.01***	0.171
Prof	1.662	0.122	13.64***	0.109
Cler	1.599	0.131	12.22***	0.110
Serv	1.006	0.134	14.98***	0.169
Craf	0.592	0.118	5.02***	0.023
Plan	0.632	0.120	5.26***	0.025
Tech	0.427	0.143	2.99**	0.017
Less ten employees	0.176	0.200	0.88	0.006
above ten employees	0.183	0.240	0.76	0.007
Paid	0.244	0.111	2.19	0.013
Constant	–17.518	0.661	–26.52***	
Pseudo R2	0.3477			
Log-likelihood	–545.3376			
Number of observations	800			

Notes: *Significant at 10% level, **significant at 5%, ***significant at 1% level of significance.

6 CONCLUSION

The current study showed preceding estimations of the portion of the non-agriculturally employed labor force in China who can WFH, measured based on their capability to use computers and their association with home-based work. Our empirical outcomes reveal that the majority of the non-agricultural workforce in the country could WFH, including those who use computers at work, home, or educational places. The survey also specified that a vast majority of the employed workforce had used the internet, while a remarkable majority own and operate mobile phones. Implementation of ICT devices is remarkably higher for individuals whose household consumption is in the top two expenditure quintiles.

The multivariate study shows that the likelihood of working remotely from home is more significant for the youth and the middle-aged employed. Individuals living in urban areas and smaller nuclear family structures are more likely to WFH. Education is also a vital factor in the capability to work remotely using ICT devices, with employed individuals with higher education having a higher likelihood of WFH. Workers involved in white-collar occupations are more likely to WFH than their counterparts engaged in lower-skilled-level occupations.

In general, the study shows a lower capability of the non-agriculturally employed workforce in China to quickly adjust to work-from-home arrangements in the case of the COVID-19-induced circumstances of large-scale lockdowns and mobility limitations. This is not surprising given that a more significant portion of employment is in the economy's informal sector, characterized by a low proportion of productivity, mainly utilizing manual labor and processes that may need to be more efficiently executed at home. These findings also align with the existing body of evidence in this area, which shows a positive relationship between a country's income level and the share of jobs that can be performed from home. Being a developing country, in some occupations, China relies on labor-intensive production technologies, which do not require extensive use of modern information and communications technology infrastructure.

The COVID-19 episode was present to underline the labor market vulnerability of the country's workforce to an external shock of this unprecedented extent, which the more developed economies have been capable of better resisting due to their well-developed instruction and communications technology infrastructure that has permitted firms and businesses to utilize remotely. From a policy stance, the analysis shows that the government needs to put in place policies and programs that will improve the ICT skills of the country's workforce in the medium to long term. This will be a difficult task since a sizeable proportion of the adult labor force has little or no formal education. Still, a start can be made by ensuring the supply of basic digital skills to students at different levels of education, especially at higher levels, who are anticipated to enter the labor market soon. Our results also support this, which revealed that the employed youth are more adept at using computers and ICT tools. Due to the ongoing demographic transition, the share of youth in the workforce is anticipated to expand notably in the coming years. There is also a requirement to invest in improving the ICT infrastructure in rural areas and backward regions of the country to encourage a more equitable acquisition of these services and tools across the country.

In terms of the current production structure of China's economy, manufacturing activities based on labor-intensive and manual tasks are not likely to be supported by WFH arrangements, while only development in the high-end services sub-sectors, like finance and banking and information and communications, can be leveraged

through WFH arrangements of the workforce. In this study, WFH adaptation challenges may be incorporated. Data constraints, regional differences, and shifting labor dynamics may be barriers. Solutions include improving data collection, targeting samples, and including longitudinal studies. This inclusion would guide future research in this sector.

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