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# Returns to military service in off-farm wage employment: Evidence from rural China☆

Benyufang Hou[a], Hong Liu[a,*], Sophie Xuefei Wang[b]

[a] China Economics and Management Academy, Central University of Finance and Economics, China
[b] China Center for Human Capital and Labor Market Research, Central University of Finance and Economics, China

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ABSTRACT

This paper studies the returns to military service in off-farm wage employment and the implications of military service on the rural-urban transition in rural China. We exploit government-induced variations in aggregate enrollment rates as our instrumental variable. Using data from the China Family Panel Studies, we find a substantial positive effect of military service on off-farm wage employment and earnings for men of rural origin, which is comparable in magnitude to the estimated returns to a college education in China. We also provide evidence that the earnings premium is likely to be explained by improved access to urban formal employment, political and human capital accumulation. However, in spite of the off-farm employment gain for all cohorts, we find that the positive earnings premium of military service is mainly concentrated among the pre-1970 cohort.

## 1. Introduction

Military service has been seen as a pervasive and influential experience in men's lives and may affect a wide range of socio-economic outcomes (Elder, 1986; MacLean, Jr, & Glen, 2007). While there exists a body of literature in economics estimating the cost or benefit of military service in the U.S. and Europe, few studies investigate how military service affects disadvantaged youths' civilian job opportunities in the context of a developing country. In this paper, we examine the implications of military service on the rural-urban transition for rural people in China.

In China, the large urban-rural divide is the main structural determinant of income inequality (Xie & Zhou, 2014). Rural individuals, who have been denied access to quality education and urban employment due to the *hukou* system, in general have worse labor market prospects than urban individuals (Liu, 2005). Serving in the military can provide an important economic opportunity for rural youths for several reasons. First, veterans are given priority hiring status and are sometimes assigned urban jobs directly in the public sector when their military service has been completed; in this way, rural veterans can also convert from rural to urban *hukou* status (Wu & Treiman, 2004). Second, military experience has been widely regarded as a quasi-political credential in China, which may be turned into economic benefits in the off-farm labor market. Third, the formal and informal learning opportunities offered in the military may improve the human capital stock of rural youth and enhance their subsequent labor market outcomes. Fourth,

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* Corresponding author.
*E-mail address:* liuhong@cufe.edu.cn (H. Liu).

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veteran status can be viewed as a screening or certification device; thus, military-related networks and signaling can also translate into a wage premium for rural people who generally have lower education.

However, in recent years public interest in military service seems to have decreased in rural China, most likely due to increased access to and increasing returns to education and greater rural-urban labor mobility. Thus, from a policy perspective, it is essential to understand the role of military service in determining the rural-urban transition for rural people and track changes in the returns across cohorts in rural China. This analysis may have important implications for policies on the military recruitment and the welfare of military veterans in China.

There is no consensus about the labor market consequences of military service in the literature on developed countries.[1] Many studies find varying degrees of negative earnings effect of military service, primarily due to the lower value of military experience than working experience in the civilian labor market. Angrist (1990) shows that white Vietnam-era veterans had lower earnings than non-veterans, while Angrist, Chen, and Song (2011) find that the veteran earnings penalty diminished to zero by the early 1990s, as they had more labor-market experience. Similarly, Angrist and Krueger (1994) find that World War II veterans earned no more than, and sometimes even less than, non-veterans. Imbens and van der Klaauw (1995) also find a negative effect of peacetime compulsory military service on earnings in the Netherlands. In contrast, two recent studies by Grenet, Hart, and Roberts (2011) and Bauer, Bender, Paloyo, and Schmidt (2012) find no impact of peacetime compulsory military service on earnings for British and German conscripts.

Several studies show some evidence that military service can lead to positive earnings outcomes for disadvantaged youth in developed countries (Angrist, 1998; Card & Cardoso, 2012; De Tray, 1982; Hirsch & Mehay, 2003). Angrist (1998) find that voluntary military service in the early 1980s led to higher employment rates and a modest increase in earnings for nonwhite veterans after service in the United States. Hirsch and Mehay (2003) estimate a positive earnings premium of 5% for African-American veterans. Card and Cardoso (2012) also find that peacetime conscription increased wages by 5% for men with only a primary school education, but had zero effect for men with higher education in Portugal. However, none of the above studies speak directly to the mechanisms underlying the veteran premium.

In this paper, we study the impact of military service on off-farm wage employment, earnings, and other labor market outcomes for men of rural origin, based on a nationally representative sample from the China Family Panel Studies (CFPS) 2010–2016. Identifying the causal effect of military service is made difficult by the selective nature of military service. One selection effect is that recruits are positively selected among registered conscripts according to physical and political criteria and other military requirements, which may lead to an overestimation of the returns to military service. Another selection effect is the self-selection of veterans. Poor rural youth may choose to enlist because they have lower expectations for educational attainment, future earnings, and job prospects, which can induce a negative bias in estimating the returns to military service.

Following the literature, we exploit variations in the aggregate enrollment rates induced by government decisions concerning the number of recruits needed in different years as the instrumental variable. In the 1970s–2000s, there were two main sources of demand-side variation in the aggregate rate of military enrollment. First, in order to focus on economic development and improve the quality of the military forces in an era of peace, the government reduced the size of the military by one million in 1980, one million in 1982, one million in 1985–1987, half a million in 1997, and 0.2 million in 2003. Second, during this period, China was also involved in several small-scale wars and battles. These events could have led to variation in demand for military recruits over time, but were uncorrelated with individuals' unobserved characteristics that might affect labor market outcomes.

This paper has several interesting findings and contributes to the existing literature in the following ways. First, to our knowledge, this paper is among the first to examine the role of military service in the labor transition from the farm sector to the off-farm sector in developing countries. We find a substantial positive effect of military service on off-farm wage employment and earnings for men of rural origin, which is comparable in magnitude to the estimated returns to a college education in China.

To shed some light on the declining interest in joining the military in China, we also investigate the cohort differences in the returns to military service. The results show that military service leads to higher off-farm employment rates for rural veterans from all cohorts; most of the earnings premium associated with military service appears to be concentrated among the pre-1970 cohorts. For the post-1970 cohorts, despite no observed earnings premium, military service still has a positive return in the off-farm labor market when fringe and non-pecuniary benefits are taken into account.

Second, the mechanisms through which military service has a wage premium for disadvantaged youths are not well understood in the literature. The rich information in the data allows us to thoroughly explore how military service affects off-farm wage earnings through a variety of possible channels. We provide evidence that the returns to military service in off-farm wage employment for rural veterans is likely to be explained by improved access to urban formal employment, political and human capital accumulation.

Our study also relates to the literature on returns to human capital investments (e.g., Chen & Hamori, 2009; Heckman & Li, 2004; Li, 2003; Li, Liu, & Zhang, 2012; Wang, 2012; Zhang, Zhao, Park, & Song, 2005). Zhao (1997) shows that education has played a significant role in increasing urban formal employment for rural people in the late 1970s and early 1980 when rural people were prohibited from moving to urban areas. With the gradual relaxation of administrative restrictions on labor mobility, Zhang, Huang, and Rozelle (2002) find that rural individuals with more education had increasing access to off-farm jobs and higher wages. De Brauw and Rozelle (2008) estimated an average return to education of 6.4% in off-farm wage employment in rural China. In this paper, we provide evidence that military service is another important mechanism through which rural youth obtain more opportunities off the

[1] Most of the literature focuses on the impact of military service on the subsequent labor market outcomes. One exception is the study by Torun (2018) that examines the effect of conscription on employment status of teenage men before they were called up for service in Spain.

farm and improve their socioeconomic status.

The remainder of this paper is organized as follows. Section 2 briefly describes the institutional background of military service in China. Section 3 outlines the potential theoretical implications of military service on off-farm job access and earnings for rural people. Section 4 explains our econometric model and estimation strategy. Section 5 describes the data and variables used in the analysis. Section 6 presents the main results and discusses potential mechanisms and cohort trend. Section 7 concludes the paper.

## 2. Institutional background

### 2.1. Military service system

The Military Service Law of China was first enacted in 1955 and amended three times in 1984, 1998, and, 2011. It stipulates that all male citizens between the ages of 18 and 22, regardless of ethnic status, race, occupation, family background, religious belief, or education, are obligated to perform military service.[2] According to the law, male citizens who have reached age 18 shall be registered for military service and remain liable for active service until they are 22 years old. Moreover, those who pass the physical examination and political background checks are eligible for enlistment. During their period of enlistment, individuals must give priority to the performance of their military duties over work obligations if they are called upon to serve while employed.

Since 1978, China has adopted a mixture of compulsory and voluntary military service systems. Soldiers subject to the compulsory military service system are called conscripts. Soldiers subject to the voluntary military service system are called non-commissioned officers. They may come from conscript applicants who have served for an extended period, or they may be citizens with professional skills in civilian divisions. Before 1999, the term of service for conscripts in the army was 3 years in the ground force, 4 years in the air force, and 4–5 years in the navy.[3] Since 1999, all mandatory conscription periods have been reduced to 2 years. In contrast, volunteers who are salary-earning professional servicemen can serve for up to 30 years.

Although mandatory military service technically exists under the law, it has rarely been enforced because China's vast population produces more than enough volunteers to meet its military needs. In addition to physical and political criteria, the military generally imposes educational standards to new recruits. Rural male recruits must have graduated at least from middle school, while urban male recruits must have a minimum of a high school education. To increase the quality of its armed forces, since De Brauw & Rozelle, 2008, preference has been given to college students and recent college graduates who enlist voluntarily.[4]

### 2.2. Military expansion and disarmaments

As shown in Fig. 1, the PLA had 5.5 million troops, consisting mainly of ground forces, in 1949 when the People's Republic of China was established. In response to the Korean War, the military force peaked at 6.27 million in 1951. Since then, the PLA has implemented 11 rounds of force reduction. The first four massive disarmaments occurred in 1950, 1952, 1953, and 1957, respectively. By the end of 1958, the PLA force was downsized to a local minimum of 2.4 million.

Following the Sino-Soviet split (1956–1966), the PLA underwent significant expansion and reached 6.1 million in 1975. The fifth military downsizing was scheduled to begin in 1975 but, due to the Cultural Revolution, it did not take place.

As China's security environment significantly improved in the 1980s, the government carried out three large-scale disarmaments in 1980, 1982, and 1985, in order to focus on economic development and produce a high-quality military. The size of the military was cut by one million in 1980, one million in 1982, and more than one million in 1985–1987. The ninth and tenth downsizing occurred between 1997 and 2000 and between 2003 and 2004, with reductions of 0.5 million and 0.2 million, respectively. These cuts brought the size of the PLA to 2.3 million by the end of 2010, making it still the largest military force in the world. Most recently, the PLA carried out the eleventh cut of 0.3 million troops from 2015 to 2017 with the purpose of speeding up military modernization.

The downsizing of the PLA affected the number and quality of newly recruits needed by the armed forces in different years. Fig. 2 shows the aggregate military enrollment rates by birth cohort from 1951 to 1987.[5] We can see that there have been considerable variations in the aggregate military enrollment rates due to military expansion and disarmaments associated with the change of the domestic and international situation.

Another exogenous source causing variations in the aggregate military enrollment rates is the demand for manpower during wartime. During the 1970s–2000s, China was involved in several small-scale conflicts, including the Vietnam War from 1965 to 1970, the Battle of the Paracel Islands in 1974, the Sino-Vietnamese War in 1979, and the Johnson South Reef Skirmish in 1988. As Fig. 2 illustrates, the overall decreasing trend in aggregate military enrollment rates has been delayed or slightly reversed for the cohorts aged 18 years during wartime.

## 3. Theoretical hypotheses

In this section, we discuss in details the theoretical implications of military service on off-farm earnings for rural people. We

[2] Women may be liable for military service when necessary.

[3] The term of service in the navy has been changed from 5 years to 4 years in 1984.

[4] For college graduates, the maximum age for recruitment can be extended to 24 years old.

[5] We explain the data sources in detail in Section 4.

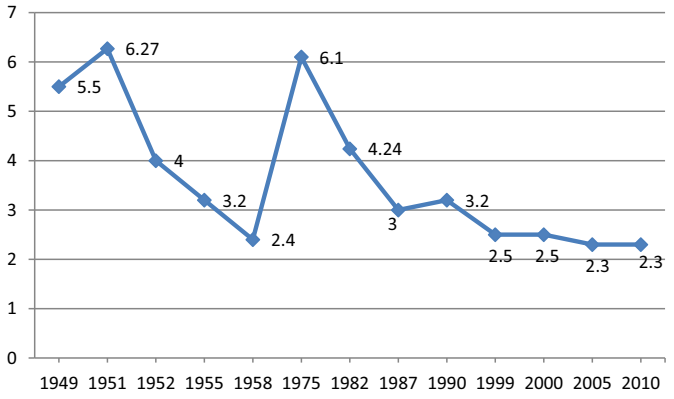


**Fig. 1.** Size of China's People's Liberation Army 1949–2010 (millions).
*Data source*: The 1982, 1990, 2000, and 2010 population censuses and the official website of the People's Daily. http://politics.people.com.cn/n/2015/0903/c1001-27543904.html

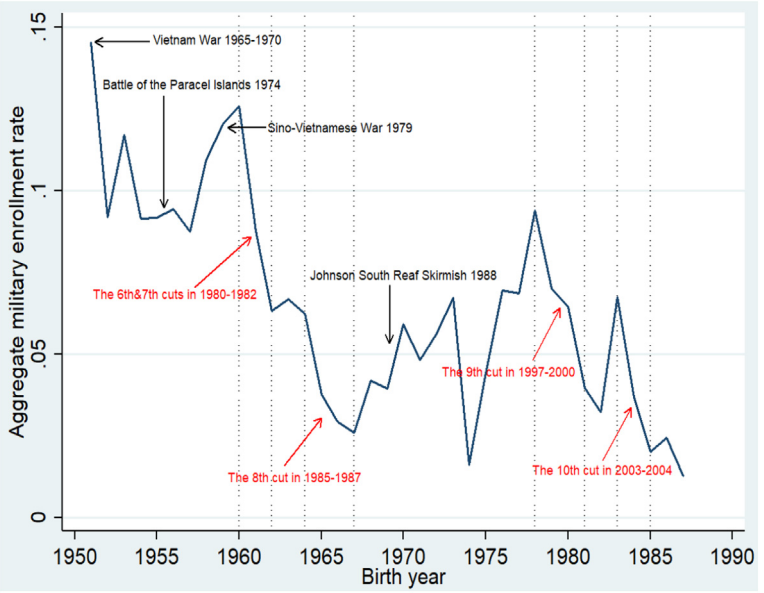


**Fig. 2.** Aggregate military enrollment rates for birth cohorts of 1951–1987.
*Data source*: The 2003 and 2006 China General Social Survey and the 2014 China Health and Retirement Longitudinal Study.

classify possible channels into the following categories: access to urban formal employment, political capital, human capital, social network and signaling.

### *3.1. Access to urban formal employment*

An important way that military service may influence off-farm earnings is through access to urban formal employment, especially public sector employment. In China, labor mobility out of the farming sector has been prevented by multiple barriers, including policy barrier (i.e., the *hukou* system), financial constraints, information costs, and geographical barrier (Liu, 2005; Park, 2008). Rural people have little access to urban jobs that pay a larger premium for skills. Joining the army is an important access route to urban formal employment, especially public sector employment, for rural youth, because of preferential treatment for veterans (Zhao, 1997).

After military service, non-officer veterans generally return to the county or city where they enlisted, while there is no such return-to-the-origin restriction for officer veterans. The local government makes proper arrangements for veterans' work and livelihood.[6] Public sector employers, including government departments, public institutions, and state-owned enterprises (SOEs), have

[6] Demobilized military personnel who plan to seek employment by themselves will receive a lump-sum financial subsidy and preferential

been assigned quotas for employing demobilized military personnel, and have a policy of preferring veterans over nonveteran applicants under similar conditions. In the private sector, enterprises and organizations that employ demobilized military personnel are entitled to certain preferential tax treatment. When rural veterans get job placement in the urban formal sector, especially the public sector, they will become eligible for urban *hukou*, and their service period will also be counted as work experience by their civilian work units (Wu & Treiman, 2004). Thus, we derive our first theoretical hypothesis:

**Hypothesis 1.** Rural veterans are likely to have higher off-farm wage earnings due to improved access to urban formal employment associated with public sector hiring preference and *hukou* conversion.

### 3.2. Political capital

As Walder (1995) suggests, in contrast to conventional human capital, political capital is a kind of productive investment, including individuals' political loyalty, conformity, and trustworthiness. It takes time and efforts for individuals to invest in political capital, and political capital are found to have positive and significant returns in terms of higher earnings, nonmonetary benefits, public sector employment, and greater career mobility in China (Li & Walder, 2001; Liu, 2003; Walder, Li, & Treiman, 2000). Military experience has been widely regarded as a quasi-political credential in China, signifying that individuals' background and behavior have been directly examined by the military's Party organization at some point and they are willing to subject to a greater degree to political responsibility (Wu & Treiman, 2004). Servicemen or ex-servicemen are also likely to turn their political advantage into Party membership, which may further improve veterans' labor market outcomes, especially entry into elite positions (Li, Liu, Zhang, & Ma, 2007; Walder, 1995).[7] So we propose our second hypothesis:

**Hypothesis 2.** Rural veterans are likely to have higher off-farm wage earnings because they accumulate more political capital through military experience.

### 3.3. Human capital

Military service may affect individuals' human capital accumulation in several ways. First, military service may improve individuals' cognitive and non-cognitive abilities, the two important predictors of labor market earnings (Lindqvist & Vestman, 2011). Specifically, the military can provide low-cost educational opportunities, sequential training programs, and a social environment conducive to learning, which may improve individuals' cognitive skills. Eynde (2016) shows evidence that military service during World War I has increased the male literacy rate in India, mainly driven by informal skill acquisition. Moreover, the military emphasizes authority, duty, teamwork, and self-discipline, which may also alter non-cognitive skills of servicemen (Benmelech & Frydman, 2015; Lopreato & Poston, 1977; Mangum & Ball, 1989). Therefore, we propose our third hypothesis:

**Hypothesis 3.** Rural veterans are likely to have higher off-farm wage earnings because they acquire better cognitive and non-cognitive skills in the military.

Second, military service may affect individuals' health status. Veterans who have been exposed to combat and war zones are found to have more mental health problems, higher disability rates, and worse later-life health (Edwards, 2015; Grossman, Cawley, & de Walque, 2018; Williamson, Diehle, Dunn, Jones, & Greenberg, 2018).[8] Bedard and Deschênes (2006) find that World War II and Korean War veterans had higher premature mortality, which they largely attribute to military-induced smoking. However, we expect that the negative health effect is likely to be modest for rural veterans in our study, because the majority of military service occurred during peacetime.

Third, veterans may acquire more education after their completion of military service. Evidence suggests that both Vietnam-era and World War II services had positive effects on education in the United States, because the GI bill schooling benefits has helped eligible veterans pay for college, graduate school, and training programs since 1944 (Angrist & Chen, 2011; Bound & Turner, 2002). In China, the potential schooling gains are likely to be modest for rural veterans, because they are only entitled to some bonus points on their college admission examination, and pursuing further education means giving up preferential treatment in job placement.[9] Thus, we don't consider the effect of military service on education attainment in this analysis, but include schooling years as a control variable.[10]

(*footnote continued*)

treatment from local governments in terms of policies.

[7] It is competitive to obtain Party membership, the political capital necessary for the administrative career path in China (Li et al., 2007).

[8] Some studies also find no causal effect of Vietnam-era military service on health outcomes (Angrist, Chen, & Frandsen, 2010; Dobkin & Shabani, 2009).

[9] Demobilized military personnel may be given some priority (e.g., 5–20 bonus points on their admission examination) in the admissions to secondary vocational schools and colleges in accordance with relevant regulations in different provinces. However, college admission is still too competitive for rural veterans who generally had junior secondary education before recruitment and need additional 3 years of high school education in order to take the college entrance exam.

[10] Another reason is that we do not know individuals' education attainment before military recruitment in the data. To test the robustness of our main results, we exclude years of schooling from our models or only control for an indicator whether the respondent has completed junior secondary

### 3.4. Social network and signaling

It is also likely that rural veterans build up important connections with their fellow soldiers, officers, and other veterans through military service, and the military-related network is an important institutional social capital that may help explain the veteran premium in off-farm labor market. The literature shows that social networks play an important role in determining one's employment status and choice of occupation, and even influence wage determination (Montgomery, 1991; Topa, 2001). Zhang and Li (2003) find that better social networks lead to a significant advantage in securing non-farm employment, especially for rural young workers in China.

Another possible explanation for the veteran premium is that veteran status can be used as a productivity screen in the labor market, allowing employers to separate more productive workers from less productive ones (De Tray, 1982). As a disadvantaged group with relatively lower educational attainment, rural youth lack an educational credential (e.g., college education) to convey information on their unobserved ability (Liu, 2005). Veteran status can be a valuable signal to employers, indicating some desirable attributes of the individual that are related to productive capabilities (De Tray, 1982; Xie, 1992). However, it is hard to test this mechanism in observational data due to no tangible measures of signaling (Jia & Li, 2017). Nevertheless, we proposal our fourth hypothesis:

**Hypothesis 4.** Rural veterans are likely to have higher off-farm wage earnings due to military-related networks and signaling.

It has to be noted that these channels are not independent of each other and it is very difficult to really pin down each channel. Below using related survey questions on other labor outcomes, *hukou* conversion, Party membership, cognitive and noncognitive abilities, health, and other factors, we attempt to examine empirically which hypotheses are more consistent with the data, and provide some suggestive evidence for the importance of these mechanisms in explaining the returns to military service.

## 4. Empirical strategy

To investigate the returns to military service in off-farm wage employment for men of rural origin, we estimate the following linear model for the log earnings:

$$ln\ Y_{ict} = \beta_0 + \beta_1 Military_{ic} + \beta_2 X_{ict} + \tau_{t-c} + \varphi_t + \omega_p + u_{ict} \quad (1)$$

where $Y_{ict}$ is annual off-farm wage earnings of person $i$ from birth cohort $c$ in year $t$. $Military_{ic}$ is a dummy variable indicating whether person $i$ from birth cohort $c$ has served in the military. $X_{ict}$ is a row vector of explanatory variables. $\tau_{t-c}$ denotes age fixed effects (i.e., $age = t - c$). $\varphi_t$ are year fixed effects. $\omega_p$ are province fixed effects, and $u_{ict}$ is a disturbance term.

The coefficient $\beta_1$ of $Military_{ic}$ is our main interest. However, OLS estimates may suffer from selection bias. First, the decision to enlist may be self-selective on the basis of personal motivation, schooling decisions, health conditions, and other unobserved factors that are correlated to earnings. For example, individuals with lower educational aspirations, probably due to financial constraints or lower initial endowment, may be more likely to enlist in the military than to continue their education. This bias would make the OLS estimator biased downward. Second, the military is also selective and imposes enlistment standards for physical and mental attributes, education, criminal history, and political background. To the extent that those who meet the enlistment standards are those who have high earning capacities, the OLS estimator is likely to be biased upward. Thus, the overall direction of the selection bias is ambiguous.

To address the endogeneity issue, we employ an instrumental variable approach. Following Imbens and van der Klaauw (1995) and Bedard and Deschênes (2006), we use the percentage of each birth cohort that served in the military as an instrument for individual veteran status. Changes at the aggregate level of the treatment over time are not, or at least are less, subject to the individual-level selection problem (Cook & Campbell, 1979). Fig. 2 illustrates that the aggregate enrollment rate by birth cohort has varied considerably over time, driven mainly by exogenous demand-side factors, including five rounds of military force reductions as well as several small-scale conflicts during the 1970s–2000s, as mentioned in the previous section. And those demand-side shocks are exogenous to individuals.[11]

One potential problem with the validity of this cohort-level instrument is that there may be unobserved cohort heterogeneities in the off-farm earnings equation. Therefore, we use a smooth cohort trend $\delta(c)$ to control for all observable and unobservable time-invariant cohort-specific differences. We assume a linear specification for the cohort trend in the main results[12] and test the

(*footnote continued*)
education (which is unlikely to be affected by military service). The estimated effects of military service on off-farm wage earnings are virtually unchanged.

[11] In our sensitivity analysis in a later subsection, we also present results using rural military enrollment rate as the instrument. We prefer the aggregate military enrollment rate as the IV in the main specification for two reasons. First, the rural military enrollment rate may be affected by rural-urban massive migration, urbanization, and other policies changes in rural areas, which may also be correlated with the rural-urban transition for men of rural origin. Thus, the rural military enrollment rate is less exogenous than the national enrollment rate in the individual off-farm earnings equation. Second, the rural military enrollment rates may have larger measurement errors because of smaller sample sizes, especially for the younger cohorts.

[12] As $age = t - c$, we cannot include age fixed effects and year fixed effects along with the linear cohort trend in the regressions. Following Bedard and Deschênes (2006), we remove one year dummy to account for this in practice.

robustness of the results using a quadratic specification. We also add three dummies for ten-year cohorts to control for the cohort effects that may not have evolved smoothly across birth cohorts. In addition, the age fixed effects $\tau_{t-c}$ allow outcomes to vary in a flexible way across individuals of different ages, while the year effects $\varphi_t$ control for those time-series changes that are the same for all cohorts. Thus, our identification strategy relies on the government-induced variation in the proportion of each birth cohort that served in the military, conditional on the cohort effects.

Identifying the causal effect of military service on wage earnings involves another issue: individual off-farm wage earning is only observed if an individual participates in the off-farm wage employment. In rural China, people in the labor force need to make a choice among farming, self-employment, and off-farm wage employment. Only when the wage offered is higher than the opportunity costs, the individual will select into the off-farm wage employment. Without a correction for this sample selection, the estimated returns to military service in off-farm wage employment may be underestimated.

Therefore, we estimate the following mixed-process recursive model that includes a linear regression for log earnings, a probit for off-farm wage employment, and a probit for military service. The model can be written as

$$ln\ Y_{ict} = \beta_0 + \beta_1 Military_{ic} + \beta_2 X_{ict} + \delta(c) + \tau_{t-c} + \varphi_t + \omega_p + u_{ict} \tag{2}$$

$$E_{ic}^{*} = \alpha_0 + \alpha_1 Military_{ic} + \alpha_2 X_{ict} + \alpha_3 H_{ict} + \delta(c) + \tau_{t-c} + \varphi_t + \omega_p + e_{ict} \tag{3}$$

$$E_{ic} = \begin{cases} 1 \text{ if } E_{ic}^{*} > 0; \\ 0 \text{ otherwise.} \end{cases}$$

$$Military_{ic}^{*} = \gamma_0 + \gamma_1 Z_c + \gamma_2 X_{ict} + \delta(c) + \tau_{t-c} + \varphi_t + \omega_p + v_{ict} \tag{4}$$

$$Military_{ic} = \begin{cases} 1 \text{ if } Military_{ic}^{*} > 0; \\ 0 \text{ otherwise.} \end{cases}$$

where $E_{ic}^{*}$ is a latent variable indicating the individual's propensity to participate in off-farm wage employment. $H_{ict}$ represents the exclusion restrictions in Eq. (3), including an indicator for land acquisition, the number of children, and the number of elderly in the household. These three variables affect an individual's reservation wage and the decision to participate in off-farm employment, but should not have a direct effect on off-farm wage earnings. $Military_{ic}^{*}$ is a latent variable representing individual *i*'s continuously-varying propensity to serve in the military. $Z_c$ denotes the percentage of cohort *c* that served in the military, which is used as the instrument for military service. The error terms in each of these equations, $u_{ict}$, $e_{ict}$, and $v_{ict}$, are assumed to be jointly normally distributed. We estimate the three equations simultaneously by simulated limited-information maximum likelihood, using the user-written Stata command "cmp" (Roodman, 2011). With joint normal disturbances, the maximum likelihood estimator is consistent and asymptotically efficient (Mroz, 1999; Vella & Verbeek, 1999).

## 5. Data and variables

The data used in this paper come from four waves of China Family Panel Studies (CFPS) conducted by the Institute of Social Science Survey of Peking University in 2010, 2012, 2014, and 2016. The CFPS project is a large-scale, nationally representative longitudinal study on Chinese communities, families, and individuals, covering 25 out of 31 provinces in China. It contains rich information on economic activities, family dynamics, education, health, migration, income, and so forth. In particular, the CFPS has collected information on individual military experience, which allows us to examine the effects of military service on outcomes in the civilian sector.

In this study, we focus on adult men of rural origin. In the CFPS, the respondents were asked about their *hukou* status at age 3, age 12, and the interview time. We define those with rural *hukou* at age 12 as those of rural origin, because *hukou* status at age 12 is more likely to reflect individuals' *hukou* status before military recruitment. From the pooled 2010–2016 CFPS sample, we start with 53,979 males with rural *hukou* at age 12 and make some sample restrictions.[13] First, we restrict the sample to men between the ages of 25 and 59, as, if they served in the military, they were likely to have finished but not yet retired. Second, we limit the sample to those cohorts born between 1951 and 1987, because there is no information on our instrumental variable, the percentage served in the military, for cohorts born after 1987 (this will be discussed later in this section). Third, we exclude those who were not working (about 16%), and those with missing information on key variables.[14] The full sample contains 27,977 individual-wave observations. Of these, 10,144 (36.3%) had annual off-farm wage earnings of at least 1000 *yuan* and are defined as participating in the off-farm wage employment. Those with no off-farm wage earnings or annual off-farm wage earnings < 1000 *yuan* are defined as not participating in the off-farm wage employment.[15] When the three-equation model is estimated, we use the full sample for Eqs. (3) and (4) and the off-farm

[13] About 76% of the CFPS male sample had rural *hukou* at age 12. We have also looked at the sample of men with urban *hukou* at age 12, but find that the instrumental variable is only weakly associated with individual veteran status, probably due to a small sample size. Another reason that we do not include the urban sample in the main analysis is that urban males don't need to choose between farming and off-farm jobs as rural males do.

[14] The labor force participation rates are very similar for the two groups in our sample: 84.5% for the veterans and 84.1% for the non-veterans. The IV estimates show that military service had no significant effect on labor force participation. Thus we do not consider the selection into the labor force. To check the robustness of the results, we have also included those not working, defined as not participating in the off-farm wage employment, and obtained similar results.

working sample for Eq. (2).

### 5.1. Key variables

We use annual off-farm wage earnings as our main dependent variable, since information on months, days, and hours worked was not consistently collected across waves. Annual off-farm wage earnings are defined as the sum of regular salary, bonuses, cash and material benefits, excluding tax and contributions to social insurance and housing funds, from formal and temporary wage employment. We focus on individual off-farm wage earnings, instead of total income from farming, self-employment, and off-farm employment, for two reasons. First, with rapid development of industrialization and urbanization, it is important to study the determinants of off-farm wage employment and earnings, in order to facilitate the transformation of the labor force from agricultural to non-agricultural sectors. Second, it is hard to measure individual labor income from farm or self-employment in the CFPS data, because farm and self-employment activities are generally home-based and their earnings are also a mix of labor and capital income.[16]

The key independent variable is a binary variable indicating individual veteran status, constructed from a survey question of whether the respondent has ever served in the military. Respondents were also asked the year they joined the military and the year that they left. Thus, we construct a continuous variable measuring years of military experience. As mentioned in Section 2, the compulsory period of military service for ordinary servicemen in the army was 3 years before 1999 and 2 years after 1999. The respondents who have served for $> 3$ years before 1999 and for $> 2$ years after 1999 are considered to be officer veterans. We generate an ordinal variable as a proxy for military rank, ranging from 0 to 2, with 0 being non-veterans, 1 being non-officer veterans, and 2 being officer veterans.

We use the percentage of each birth cohort that served in the military as an instrumental variable for individual veteran status. This variable is based on data from two nationally representative surveys in China: the 2003 and 2006 China General Social Survey (CGSS), and the 2014 China Health and Retirement Longitudinal Study (CHARLS).[17] The CGSS is a repeated cross-sectional survey of adults aged 18 and above, and includes information on whether individuals ever served or currently served in the military. The CHARLS is a biennial panel survey of people aged 45 years or older and their spouses. The 2014 CHARLS is a special life history survey containing information about individual veteran status. The 2014 CHARLS has relatively more observations for males born before 1972, while the 2003 and 2006 CGSS have more observations for males born after 1972. In the pooled male sample from these two data sources, we have $> 100$ observations for most of the cohorts from 1951 to 1987.[18] We calculate the percentage of cohort members who served in the military for birth cohorts from 1951 to 1987,[19] and match it with the CFPS by birth cohort.[20] The advantage of using the pooled data is to ensure that there are enough observations (including veterans) of each birth cohort so that a more reliable measure of percentage served can be obtained for each cohort.[21]

### 5.2. Other independent variables and descriptive statistics

All models estimated control for age dummies, years of schooling, marital status, and an indicator of Han ethnicity. In Eq. (3), we include the number of children under age 16 and the number of elderly (aged 60 and above) in the household and land acquisition as additional regressors serving as exclusive restrictions. The measure of land acquisition is a binary variable indicating whether any land owned by the household has ever been requisitioned.

Table 1 presents summary statistics of the variables used in the analysis. On average, 5% of men of rural origin have ever served in the military. For veterans, the length of military service ranged from a minimum of 2 years to a maximum of 31 years, with a median of 3 years and a mean of 4.5 years.[22] About 49% of the veterans served longer than the conscription requirement, and are thus

[15] About 473 observations report annual off-farm wage earnings $< 1000$ *yuan*, which seems unusually low. To reduce noise in the data, we define them as not participating in the off-farm wage employment. To assess the sensitivity of our results to these possible outliers, we have also defined them as participating in the off-farm wage employment or excluded them. The results are similar to those presented in Table 2.

[16] In our robustness checks in a later subsection, we also construct a proxy for individual farm/business income and estimate the results for individual total income. Moreover, it should be noted that the off-farm self-employed sample is taken as not participating in the off-farm wage employment in this analysis; if we exclude them, the results remain unchanged.

[17] Both surveys are large-scale data collection projects conducted by top-tier academic institutions in China.

[18] In Figure A1 in the Appendix, the top part shows that the cohort trends in the aggregate military enrollment rates are similar using CGSS 2003, CGSS 2006, and CHARLS 2014, separately. In the bottom part of Figure A1, the CGSS and CHARLS pooled sample and the CFPS pooled sample have seen similar variations in the aggregate military enrollment rates by birth cohort.

[19] The measure based on the pooled data is actually the weighted average of the measures from the CGSS and the CHARLS. For a birth cohort, it is computed by averaging the measures from each survey, weighted by the sample size of this cohort in each survey.

[20] As a robustness check, we also construct the instrument using the pooled sample of CGSS 2003 and 2006, CHARLS 2014, and CFPS 2010–2016 (excluding the respondent). The estimates are similar to our main results.

[21] We do not consider sampling weights of each survey here, because the sampling weights can be used to produce population-appropriate estimates but not cohort-appropriate estimates. We have to admit that our measure of percentage served in each cohort may have measurement errors due to the differences in sampling procedures between the CGSS and the CHARLS. However, evidence suggests that our IV satisfies the relevance condition. More importantly, the results are robust when we construct the IV using CGSS, CHARLS, CFPS, respectively. Thus, we believe that the measurement error of the IV based on the pooled data is of little concern for our main results.

[22] Consistent with the decreasing trend of the aggregate military enrollment rates in Fig. 2, the length of military service for veterans also

**Table 1**
Summary statistics.

| | Full sample | | | Veterans | Non-veterans | Diff. |
|---|---|---|---|---|---|---|
| | N | Mean | SD | Mean | Mean | |
| *Key variables* | | | | | | |
| Off-farm employment | 27,977 | 0.363 | 0.481 | 0.471 | 0.353 | 0.118*** |
| Off-farm earnings (10,000 *yuan*) | 10,144 | 2.958 | 3.239 | 3.202 | 2.921 | 0.282** |
| Military service | 27,608 | 0.050 | 0.218 | 1 | 0 | 1 |
| Years of military experience | 27,574 | 0.222 | 1.301 | 4.558 | 0 | 4.558*** |
| Military rank | 27,574 | 0.073 | 0.341 | 1.497 | 0 | 1.497*** |
| *Instruments/exclusion restrictions* | | | | | | |
| Percentage served in birth cohort | 27,977 | 0.060 | 0.029 | 0.071 | 0.059 | 0.011*** |
| Number of children | 27,977 | 0.951 | 1.014 | 0.818 | 0.956 | −0.138*** |
| Number of elderly | 27,977 | 0.427 | 0.701 | 0.306 | 0.433 | −0.126*** |
| Land acquisition | 27,964 | 0.211 | 0.408 | 0.231 | 0.211 | 0.020* |
| *Covariates* | | | | | | |
| Age | 27,977 | 43.50 | 9.205 | 45.88 | 43.56 | 2.323*** |
| Birth year | 27,977 | 1969 | 9.297 | 1967 | 1969 | −2.472*** |
| Han ethnicity | 27,925 | 0.908 | 0.289 | 0.943 | 0.906 | 0.037*** |
| Married | 27,975 | 0.922 | 0.269 | 0.948 | 0.922 | 0.026*** |
| Years of schooling | 27,269 | 7.867 | 4.074 | 9.834 | 7.747 | 2.087*** |
| *Potential channels* | | | | | | |
| Public sector employment | 27,977 | 0.107 | 0.310 | 0.256 | 0.099 | 0.156*** |
| White-collar work | 20,081 | 0.049 | 0.216 | 0.089 | 0.046 | 0.043*** |
| Inter-province migration | 27,899 | 0.028 | 0.164 | 0.040 | 0.026 | 0.015*** |
| Current urban *hukou* status | 27,680 | 0.164 | 0.371 | 0.319 | 0.156 | 0.163*** |
| Party membership | 27,966 | 0.100 | 0.299 | 0.482 | 0.080 | 0.402*** |
| Total cognitive score | 11,949 | 32.225 | 11.597 | 36.202 | 31.911 | 4.291*** |
| Internal locus of control | 5606 | 0.038 | 0.581 | −0.027 | 0.046 | −0.073** |
| External locus of control | 5554 | −0.024 | 0.653 | −0.028 | −0.024 | −0.005 |
| Good self-reported health | 21,960 | 0.369 | 0.483 | 0.375 | 0.368 | 0.007 |
| Chronic disease | 27,397 | 0.104 | 0.306 | 0.135 | 0.104 | 0.031*** |
| Number of visits by friends | 5948 | 4.008 | 7.170 | 4.132 | 4.023 | 0.109 |
| Receive help in job search | 6016 | 0.092 | 0.290 | 0.060 | 0.093 | −0.033** |
| *Nonpecuniary benefits* | | | | | | |
| Public housing funding | 27,977 | 0.072 | 0.259 | 0.162 | 0.067 | 0.095*** |
| Public pension for employees | 27,977 | 0.126 | 0.332 | 0.252 | 0.120 | 0.132*** |
| Public medical insurance for employees | 27,977 | 0.115 | 0.319 | 0.269 | 0.106 | 0.163*** |

Notes: *t*-test was applied for pairwise comparisons between veterans and non-veterans.
*** $p < .01$.
** $p < .05$.
* $p < .1$.

regarded as officer veterans in this paper.

Standard *t*-tests indicate the significant level of the direct comparisons between veterans and non-veterans. The veterans were 12% more likely to participate in the off-farm wage employment and had significantly higher off-farm wage earnings than the non-veterans. In addition, in comparison with non-veterans, the veterans had more education and fewer children and elderly dependents; they were older and were more likely to be *Han* and married.

## 6. Results

### 6.1. Returns to military service in the off-farm labor market

Table 2 reports three sets of results for log off-farm earnings, with clustered standard errors at the year-of-birth level. In column 1 of Table 2, the results from the OLS estimation using the off-farm working sample show that there is no association between military service and off-farm earnings. The OLS estimates are probably biased due to the problems of endogeneity and sample selection.

Using the off-farm working sample, columns 2 and 3 of Table 2 presents the IV estimation results for a two-equation model consisting of Eqs. (2) and (4), with the estimated marginal effects on the probability of serving in the military reported in column 3. The instrumental variable, the percentage served in each birth cohort, is strongly positively correlated with individual veteran status,

(*footnote continued*)
decreased over time.

**Table 2**
Effects of military service on off-farm earnings and employment.

| | OLS | IV | | IV: a three-equation model | | |
|---|---|---|---|---|---|---|
| | Log earnings | Log earnings (linear) | Military service (probit) | Log earnings (linear) | Off-farm work (probit) | Military service (probit) |
| | (1) | (2) | (3) | (4) | (5) | (6) |
| Military service | 0.041 | 0.336*** | | 0.445*** | 0.377*** | |
| | (0.038) | (0.072) | | (0.099) | (0.073) | |
| Percentage served | | | 0.481*** | | | 0.448*** |
| | | | (0.096) | | | (0.091) |
| Years of schooling | 0.039*** | 0.037*** | 0.007*** | 0.040*** | 0.015*** | 0.007*** |
| | (0.002) | (0.002) | (0.001) | (0.002) | (0.001) | (0.001) |
| Married | 0.134*** | 0.131*** | 0.008 | 0.132*** | 0.004 | 0.006 |
| | (0.034) | (0.034) | (0.006) | (0.034) | (0.010) | (0.006) |
| Han ethnicity | −0.018 | −0.023 | 0.015* | −0.011 | 0.085*** | 0.016* |
| | (0.056) | (0.056) | (0.009) | (0.055) | (0.020) | (0.009) |
| Number of children | | | | | −0.018*** | |
| | | | | | (0.004) | |
| Number of elderly | | | | | −0.011*** | |
| | | | | | (0.004) | |
| Land acquisition | | | | | 0.037*** | |
| | | | | | (0.010) | |
| ρ_*ew* | | | | 0.088** | | |
| | | | | (0.034) | | |
| ρ_*em* | | −0.206*** | | −0.252*** | | |
| | | (0.037) | | (0.053) | | |
| ρ_*wm* | | | | −0.501*** | | |
| | | | | (0.143) | | |
| Observations | 9677 | 9677 | | 9677 | 26,915 | |

Notes: The significance levels of 1%, 5%, and 10% are denoted by ***, **, and *, respectively. Standard errors clustered at the year-of-birth level are reported in parentheses. Marginal effects are reported for probit regressions in columns 3, 5, and 6. All regressions control for age fixed effect, year fixed effect, province fixed effect, ten-year cohort fixed effect, and a linear cohort trend.

with statistical significance at the 1% level. A one-percentage-point increase in the aggregate military enrollment rate for a birth cohort increased the likelihood by 0.5 percentage points that an individual served in the military. The IV estimate of military service in column 2 is positive and significant at the 1% level, which is larger in magnitude than the OLS estimate in column 1, suggesting that veterans earned 33.6% more than non-veterans. As we find a negative and significant correlation between the error terms of the log earnings equation and the military service equation (i.e., $\rho\_em = -0.206$), the null hypothesis of exogeneity of individual veteran status can be rejected at the 1% level. This implies that the unobserved individual propensity to serve in the military is negatively associated with unobserved earning capacity. Thus, once we control for selection bias, we find a positive effect of military service on off-farm wage earnings.

Columns 4–6 of Table 2 report the IV estimation results for the three-equation model, consisting of Eqs. (2), (3), and (4), using the full sample. This model establishes whether the effect of military service on off-farm wage earnings still holds after controlling for the selection into the off-farm wage employment. Compared to the IV estimate in column 2, the IV estimate associated with military service in the log earnings equation in column 4 remains positive and significant, but becomes larger in magnitude. We find that military service significantly increased the off-farm earnings of the veterans from rural origins by 44.5%.[23]

In the off-farm labor force participation equation, the IV estimate in column 5 shows that the veterans were 37.7% more likely to participate in the off-farm wage employment than the non-veterans. Regarding the exclusion restrictions, the number of children and the number of elderly have negative and significant effects on the likelihood of off-farm wage employment, while land acquisition, as expected, is positively correlated with the individual's off-farm work status.

The likelihood ratio tests strongly reject the null hypothesis of no correlation among the error terms of the three equations. The correlation coefficient between the unobserved determinants of the off-farm employment and the off-farm wage earnings are statistically significant and positive (i.e., $\rho\_ew = 0.088$), suggesting that unobserved individual heterogeneities such as ability affected both off-farm employment and earnings in the same way. We find that unobserved determinants of military service are significantly negatively correlated with unobserved determinants of both off-farm employment status and earning (i.e., $\rho\_wm = -0.501$ and

[23] As a robust check, we conduct 2SLS estimations for log off-farm wage earnings, which adopts a linear probability model for the military service equation. The strong correlation between percentage served in the birth cohort and individual veteran status has a partial *F*-statistic of 12.57, well above the usual threshold value for weak-strong IV in the literature. The 2SLS estimate on military service is 0.336 without sample selection correction and 0.487 with Heckman sample selection correction, both very close to the estimates in columns 2 and 4 of Table 2, albeit insignificant. It is because the 2SLS is consistent but less efficient than the simultaneous estimation that takes into account the full covariance structure (Roodman, 2011).

$\rho\_em = -0.252$), which is consistent with a story of negative selection into the military.

With regard to other regressors in the three equations, we find that education is positively associated with the likelihood of joining the army, off-farm wage employment, and off-farm wage earnings. Please note that we include schooling years in our models as a control variable, but the coefficient on schooling years likely do not identify a causal effect. Importantly, our results are robust to excluding education from our models. Moreover, Han males were also more likely to serve in the military than minority males, which is significant at the 10% level. Males' marital status is positively correlated with off-farm earnings.

### 6.2. Mechanisms of earnings premium

Given our main findings that veterans of rural origin gain substantial earnings premium in the off-farm wage employment, we further explore multiple potential channels from military service to off-farm wage earnings, and examine the hypotheses proposed in Section 3. The sample sizes for the regression analysis are different for different outcomes, depending on the data availability.[24]

#### 6.2.1. Access to urban formal employment

As noted above, military service may affect rural veterans' off-farm earnings by increasing their entry into urban formal employment, especially public sector employment, due to preferential treatment for the demobilized military personnel. There are four variables measuring one's access to urban formal employment. We construct a binary variable indicating whether the respondent worked in the public sector, including government departments, public institutions, and SOEs, and a binary variable indicating a blue- or white-collar job, which equals 1 if the respondent held an administrative or management position. Respondents were asked their province of current residence and province of residence at age 12. We construct a binary measure of inter-province migration, which takes the value of 1 if the respondents resided and worked in a province different from the one they lived in at age 12. A dummy variable is created to measure whether the respondent has converted from rural to urban *hukou* status.

In panel A of Table 3, the estimation results from the probit models using the full sample show that military service is positively associated with public sector employment, white-collar work, inter-province migration, and *hukou* conversion. In panel B of Table 3, we estimate a bivariate probit model in which the military service variable is instrumented. In columns 1–3, we can see that military service significantly increased the likelihood of being employed in the public sector and having a white-collar job; military service also led to a significant increase in the likelihood that veterans migrated out of their home province. Column 4 shows that the veterans were significantly more likely to convert from rural *hukou* to urban *hukou*. Consistent with our main results, most of the correlation coefficients between the outcome equation and the military service equation are significant and negative. These results provide supportive evidence for our Hypothesis 1 that improved access to urban formal employment may translate into off-farm earnings gains for rural veterans.

In panel C of Table 3, we restrict the sample to those who participated in the off-farm labor force (i.e., the subsample for the off-farm earnings equation). We obtain results similar to those in panel B, except that the estimated effect of military service on *hukou* conversion becomes insignificant, probably due to the sample selection.

#### 6.2.2. Political capital

Next, we consider whether military service affects rural people's political capital, as laid out in Hypothesis 2. Political capital is measured by a binary variable indicating whether the respondent was a Party member. In column 1 of Table 4, the OLS estimate shows a significant positive association between military service and an individual's Party membership. The IV estimates of military service in panels B and C are positive and significant at the 1% level, indicating that military service significantly increases the likelihood that rural men become Party members. This result supports our Hypothesis 2 and confirms that military service plays a role in rural people's political capital investment. As discussed in Section 3, the literature suggests that Party membership can be viewed as a credential like educational credential, and is beneficial for individuals' income and entry into high-paying jobs in monopolistic state-owned enterprises and government (Liu, 2003; Walder, 1995).

#### 6.2.3. Human capital

As highlighted in Section 3 above, another important channel for the returns to military service is human capital accumulation. We consider three important categories of human capital that are closely associated with labor market outcomes: cognitive abilities, non-cognitive abilities, and health.

Cognitive abilities are measured by scores from the vocabulary and math tests administered in CFPS 2010 and 2014. Based on 34 verbal questions and 24 standardized mathematics questions, we obtain a verbal test score from 0 to 34 and a math test score from 0 to 24 that reflect an individual's vocabulary and mathematical ability, respectively. A total score is calculated by aggregating the two subtest scores. We use locus of control (LOC) to measure individuals' non-cognitive abilities. It indicates individuals' beliefs about the extent to which life's outcomes are due to their own efforts (i.e., internal locus of control) or due to external factors (i.e., external locus of control). The internal and external loci of control are measured separately using an index consisting of five items surveyed in CFPS 2010.[25] Respondents were asked to rate each item on a five-point scale (e.g., 1 = strongly disagree, 5 = strongly agree).

[24] Cognitive scores are available in CFPS 2010 and 2014. Internal and external loci of control, number of friend visits, and whether one received help in job search are only available in CFPS 2010.

[25] For internal locus of control, the five items include (1) “In today's society, hard word is rewarded.” (2) “The most important factor affecting

**Table 3**
Military service and access to urban formal employment.

| | Public sector employment | White-collar work | Inter-province migration | Current urban *hukou* status |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| Panel A. Full sample, probit estimates | | | | |
| Military service | 0.074*** | 0.012** | 0.013** | 0.066*** |
| | (0.010) | (0.005) | (0.005) | (0.010) |
| Panel B. Full sample, bivariate probit estimates | | | | |
| *Model 1. Outcomes* | | | | |
| Military service | 0.242*** | 0.156*** | 0.081*** | 0.254*** |
| | (0.033) | (0.030) | (0.031) | (0.042) |
| *Model 2. Military service* | | | | |
| Percentage served | 0.453*** | 0.495*** | 0.481*** | 0.455*** |
| | (0.094) | (0.086) | (0.095) | (0.094) |
| ρ | −0.556*** | −0.812*** | −0.552** | −0.496*** |
| | (0.115) | (0.196) | (0.227) | (0.129) |
| Observations | 26,909 | 19,077 | 26,863 | 26,659 |
| Panel C. Off-farm working sample, bivariate probit estimates | | | | |
| *Model 1. Outcomes* | | | | |
| Military service | 0.393*** | 0.309*** | 0.219*** | −0.112 |
| | (0.051) | (0.074) | (0.052) | (0.075) |
| *Model 2. Military service* | | | | |
| Percentage served | 0.655*** | 0.690*** | 0.621*** | 0.610*** |
| | (0.141) | (0.137) | (0.143) | (0.162) |
| ρ | −0.648*** | −0.854*** | −0.825*** | 0.381** |
| | (0.143) | (0.294) | (0.277) | (0.160) |
| Observations | 9669 | 6333 | 9641 | 9516 |

Notes: The significance levels of 1%, 5%, and 10% are denoted by ***, **, and *, respectively. Standard errors clustered at the year-of-birth level are reported in parentheses. Marginal effects are reported for the probit and bivariate probit regressions. All regressions control for years of schooling, marital status, Han ethnicity, age fixed effect, year fixed effect, province fixed effect, ten-year cohort fixed effect, and a linear cohort trend.

**Table 4**
Military service and political and human capital.

| | Party membership | Cognitive score | Internal LOC | External LOC | Good self-rated health | Chronic disease |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| Panel A. Full sample, OLS/probit estimates | | | | | | |
| Military service | 0.178*** | 1.160*** | −0.068 | 0.009 | 0.028 | 0.017** |
| | (0.010) | (0.334) | (0.044) | (0.036) | (0.020) | (0.008) |
| Panel B. Full sample, IV/bivariate probit estimates | | | | | | |
| *Model 1. Outcomes* | | | | | | |
| Military service | 0.248*** | 9.211*** | −0.148 | 0.154 | 0.173 | 0.083 |
| | (0.047) | (0.840) | (0.203) | (0.095) | (0.273) | (0.078) |
| *Model 2. Military service* | | | | | | |
| Percentage served | 0.449*** | 0.568*** | 0.588*** | 0.619*** | 0.374*** | 0.490*** |
| | (0.106) | (0.103) | (0.143) | (0.125) | (0.101) | (0.096) |
| ρ | −0.279 | −0.544*** | 0.072 | −0.114* | −0.190 | −0.178 |
| | (0.204) | (0.055) | (0.178) | (0.063) | (0.365) | (0.206) |
| Observations | 26,900 | 11,740 | 5418 | 5367 | 21,099 | 26,431 |
| Panel C. Off-farm working sample, IV/bivariate probit estimates | | | | | | |
| *Model 1. Outcomes* | | | | | | |
| Military service | 0.297*** | 7.210*** | −0.081 | 0.008 | −0.322 | 0.012 |
| | (0.057) | (1.113) | (0.225) | (0.218) | (0.375) | (0.225) |
| *Model 2. Military service* | | | | | | |
| Percentage served | 0.567*** | 0.630*** | 0.742*** | 0.750*** | 0.594*** | 0.645*** |
| | (0.166) | (0.161) | (0.286) | (0.274) | (0.164) | (0.153) |
| ρ | −0.393 | −0.458*** | 0.028 | −0.002 | 0.511 | 0.013 |
| | (0.259) | (0.077) | (0.191) | (0.164) | (0.701) | (0.698) |
| Observations | 9669 | 4990 | 2511 | 2510 | 7062 | 9338 |

Notes: The significance levels of 1%, 5%, and 10% are denoted by ***, **, and *, respectively. Standard errors clustered at the year-of-birth level are reported in parentheses. Marginal effects are reported for the probit and bivariate probit regressions in columns 1, 5 and 6. All columns control for age fixed effect and year fixed effect except columns 3 and 4, which control for age and age squared. All regressions control for years of schooling, marital status, Han ethnicity, province fixed effect, ten-year cohort fixed effect, and a linear cohort trend.

Following Chen, Lu, and Xie (2018), we compute a z-score for each item and use the average of five z-scores as an index of internal or external locus of control, with higher scores indicating higher levels.

Columns 2–4 of Table 4 examine the effects of military service on individuals' cognitive and non-cognitive abilities, using the full sample and the subsample in the off-farm wage employment. The OLS estimates in panel A show that military service is only positively correlated with cognitive scores, but uncorrelated with internal and external loci of control. The IV estimates in panels B and C show that veterans had significantly higher cognitive scores than non-veterans[26]; however, there is no evidence that military service had effects on internal and external loci of control. These findings partially support Hypothesis 3 and suggest that military service improves rural veterans' cognitive skills, which is consistent with the study by Eynde (2016).

We expect little health effect of military service for rural veterans; however, to complete the picture of the impact of military service on human capital, we construct two binary measures for health: whether the respondent reported being in excellent or good health and whether the respondent has had any doctor-diagnosed chronic disease in the previous six months. In columns 5 and 6 in Table 4, the estimate of military service is positive and significant for chronic disease in the probit estimation, but becomes insignificant in the bivariate probit estimation. We find no significant effect of military service on self-reported health. Similar results have been observed for the off-farm working subsample in panel C. Although these results are inconsistent with the relevant studies (Bedard & Deschênes, 2006; Edwards, 2015; Grossman et al., 2018), they are plausible given the fact that the military service we study occurred mainly during peacetime.[27]

#### 6.2.4. Social network and signaling

As discussed in Section 3, there are two other potential explanations for the veteran premium in the off-farm wage employment: social network and signaling. We use number of visits by friends during the Spring Festival as a proxy for one's social networks. In column 1 of Table 5, the IV estimate in panel B shows that, as expected, rural veterans have significantly more visits by friends during the Spring Festival than non-veterans. As this measure cannot capture all the dimensions of social networks, this finding is suggestive of support for the military-related network mechanism.

We have no tangible measures of signaling in the CFPS data. Following Jia and Li (2017), we attempt to provide suggestive evidence using information on whether the respondent has received personal help during the job search process, although networks and signaling are likely to work together here. In column 2 of Table 5, the IV estimate in panel B indicates that rural veterans are less likely to seek personal help in job search, which is significant at the 10% level. This finding is consistent with an interpretation of signaling: rural veterans are likely to search jobs using institutional (i.e., military-related) channels rather than personal channel. However, as we have no direct measure of military-related job search, the results presented here are only suggestive. Moreover, the results are not robust when using the off-farm working subsample, as can be seen in panel C.

#### 6.2.5. Mediation analysis

We now conduct a mediation analysis to provide further evidence that the proposed channels help explain the linkage between military service and off-farm wage earnings. In Table 6, column 1 presents the main results from Table 2. Columns 2–8 add seven channel variables (that are significantly affected by military service in Tables 3–5) one at a time, and column 9 reports the estimation results when controlling for all seven channel variables in the regression.

The results provide suggestive evidence that obtaining Party membership is likely to be the most important mechanism underlying the returns to military service, followed by obtainment of a white-collar job, public sector employment, inter-province migration, and *hukou* conversion. Improved cognitive skills and greater social networks are two other transmission channels. In column 9, the estimated effect of military service on off-farm earnings shrinks considerably, and the effect on off-farm employment is almost zero and insignificant. All in all, these channels explain almost the total effect of military service on off-farm employment status and account for about 35% of the total effect on off-farm earnings.

### 6.3. Returns to military service across cohorts

Since the 1980s, China has been in transition from a planned economy to a market-based economy. The government has taken a series of actions to develop education in order to meet the needs of social and economic development. In 1986, it made nine years of education compulsory for all children, and, beginning in 1999, it launched a college expansion program providing students with greater access to higher education. In addition, in the mid-1980s and early 1990s, the urban labor market reform ended the system of guaranteed lifetime employment and allowed firms to hire suitable workers and offer competitive salaries. Meanwhile, the role of non-state enterprises, including private, foreign, and mixed-ownership enterprises, has become more important in the labor market.

(*footnote continued*)
one's future success is his/her effort." (3) "The higher level of education one receives, the higher the probability of his/her future success." (4) "The most important factor affecting one's future success is his/her talent." (5) "In today's society, intellect is rewarded." For external locus of control, the five items include (1) "The most important factor affecting one's future success is his/her luck." (2) "The most important factor affecting one's future success is whether his/her family has connections." (3) "The higher a family's social status is, the greater the child's future achievement will be." (4) "A child from a rich family has a better chance of succeeding in the future; a child from a poor family has a worse chance of succeeding in the future." (5) "In today's society, having social connections is more important than having individual capability."

[26] We find similar results when using math test scores and verbal test scores as two separate measures of cognitive abilities.

[27] We have also estimated the effect of military service on smoking behavior, and find no significant effect of veteran status.

**Table 5**
Military service and social networks and signaling.

| | Number of visits by friends | Receive personal help in job search |
|---|---|---|
| | (1) | (2) |
| Panel A. Full sample, probit/OLS estimates | | |
| Military service | 0.083 | −0.021 |
| | (0.463) | (0.018) |
| Panel B. Full sample, bivariate probit/IV estimates | | |
| *Model 1. Outcomes* | | |
| Military service | 11.299*** | −0.108* |
| | (0.712) | (0.063) |
| *Model 2. Military service* | | |
| Percentage served | 0.501*** | 0.585*** |
| | (0.169) | (0.127) |
| ρ | −1.197*** | 0.292 |
| | (0.175) | (0.203) |
| Observations | 5757 | 5809 |
| Panel C. Off-farm working sample, bivariate probit/IV estimates | | |
| *Model 1. Outcomes* | | |
| Military service | −0.376 | −0.045 |
| | (1.045) | (0.164) |
| *Model 2. Military service* | | |
| Percentage served | 0.754*** | 0.752*** |
| | (0.275) | (0.270) |
| ρ | 0.031 | −0.043 |
| | (0.069) | (0.427) |
| Observations | 2580 | 2590 |

Notes: The significance levels of 1%, 5%, and 10% are denoted by ***, **, and *, respectively. Standard errors clustered at the year-of-birth level are reported in parentheses. Marginal effects are reported for the probit and bivariate probit regressions in column 2. Based on cross section data from CFPS 2010, all regressions control for years of schooling, marital status, Han ethnicity, age, age squared, year fixed effect, province fixed effect, ten-year cohort fixed effect, and a linear cohort trend.

As a result, the returns to education increased dramatically from the 1980s to the 2000s (Wang, 2012; Zhang et al., 2005). Better access to education and increasing returns to education imply an increased opportunity cost associated with military service. Thus, in this subsection, we examine whether and why the returns to military service vary across cohorts.

Table 7 presents the IV estimation results for the older cohorts 1951–1970 and the younger cohorts 1971–1987 separately.[28] In panel A, we can see that for the veterans in the pre-1970 cohorts, military service significantly improved the likelihood of engaging in off-farm employment by 28.1 percentage points and led to a 57.0% increase in off-farm earnings. In contrast, the veterans in the post-1970 cohorts saw only a significant increase in the likelihood of off-farm employment of 46.9 percentage points, but no earnings premium.

In panel B of Table 7, regarding the main channels variables, we find that military service had no differential effects across cohorts on public sector employment, white-collar work, *hukou* conversion, cognitive skills, and social networks. The veteran advantage in Party membership was higher for the post-1970 cohorts than for the pre-1970 cohorts, which is inconsistent with the diminished veteran premium for the younger cohorts.

The results indicate that the positive effect of military service on inter-province migration is concentrated in the pre-1970 cohorts. Among the post-1970 cohorts, the estimates are small and insignificant. Given the government's restrictive policy on labor migration from rural to urban areas in the 1970s and the early 1980s, our findings imply that military service played an important role in increasing the probability of migration and labor mobility out of the farming sector for rural people in the pre-1970 cohorts. It provides suggestive evidence that the diminished veteran premium for the post-1970 cohorts was probably the result of the massive rural-urban migration and the development of the private sector and foreign enterprises from the mid-1980s. The growth of the private sector and flows of foreign capital generated greater demand for rural migrant workers (Li, 2010; Zhao, Liu, & Zhang, 2018). While the number of enterprises in the public sector decreased over time, the earnings gap between the public and private sectors has been shrinking over time to arrive at close to zero (Démurger, Li, & Yang, 2012; Sun, Wang, & Li, 2016). The observed earnings convergence in favor of the private sector may help explain why the earnings premium for rural veterans, primarily due to their advantage in the public sector, disappeared for the post-1970 cohorts.

In addition, it has to be noted that our measure of annual off-farm wage earnings, which excludes contributions to housing funding and social insurance, may not fully reflect an individual's actual income and is likely to underestimate the total compensation in the public sector. The job-related social welfare provided to employed workers in the public sector is generally much better than

[28] The post-1970 cohorts have been exposed to the education reforms in the 1980s and 1990s. Because of our limited sample size, we cannot look at the results for a smaller range of birth cohorts.

**Table 6**
Mediation analysis (IV estimation for the three-equation model).

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
|---|---|---|---|---|---|---|---|---|---|
| Model 1. Log off-farm earnings (linear) | | | | | | | | | |
| Military service | 0.445*** | 0.383*** | 0.382*** | 0.405*** | 0.408*** | 0.302*** | 0.430*** | 0.441*** | 0.288*** |
| | (0.099) | (0.118) | (0.091) | (0.092) | (0.090) | (0.103) | (0.098) | (0.099) | (0.089) |
| Public sector employment | | 0.027 | | | | | | | 0.007 |
| | | (0.021) | | | | | | | (0.021) |
| White-collar work | | | 0.326*** | | | | | | 0.279*** |
| | | | (0.028) | | | | | | (0.029) |
| Inter-province migration | | | | 0.142*** | | | | | 0.139*** |
| | | | | (0.050) | | | | | (0.046) |
| Current urban *hukou* status | | | | | 0.068** | | | | 0.067** |
| | | | | | (0.031) | | | | (0.030) |
| Party membership | | | | | | 0.019 | | | −0.034 |
| | | | | | | (0.034) | | | (0.034) |
| Total cognitive score | | | | | | | 0.001 | | −0.000 |
| | | | | | | | (0.001) | | (0.001) |
| Number of visits by friends | | | | | | | | 0.006** | 0.004** |
| | | | | | | | | (0.002) | (0.002) |
| Model 2. Off-farm work (probit) | | | | | | | | | |
| Military service | 0.377*** | 0.172 | 0.236** | 0.367*** | 0.344*** | 0.099 | 0.343*** | 0.376*** | 0.043 |
| | (0.073) | (0.239) | (0.111) | (0.080) | (0.076) | (0.149) | (0.082) | (0.074) | (0.127) |
| Model 3. Military service (probit) | | | | | | | | | |
| Percentage served | 0.448*** | 0.479*** | 0.473*** | 0.455*** | 0.458*** | 0.513*** | 0.458*** | 0.449*** | 0.525*** |
| | (0.091) | (0.094) | (0.095) | (0.093) | (0.095) | (0.091) | (0.093) | (0.091) | (0.090) |
| Observations | 9677 | 9677 | 9677 | 9677 | 9677 | 9677 | 9677 | 9677 | 9677 |

Notes: The significance levels of 1%, 5%, and 10% are denoted by ***, **, and *, respectively. Standard errors clustered at the year-of-birth level are reported in parentheses. Marginal effects are reported for the probit regressions. All regressions control for years of schooling, marital status, Han ethnicity, age fixed effect, year fixed effect, province fixed effect, ten-year cohort fixed effect, and a linear cohort trend. The exclusion restrictions for the off-farm work equation include number of children, number of elderly, and land acquisition. Columns 2–9 control for the channel variables and indicators whether the channel variables are missing in all the three equations, but only report the estimates for the channel variables in the earnings equation in order to save space.

that in the private and informal sector.

To clarify the difference in social insurance benefits associated with individual veteran status, we create three indicators to measure non-pecuniary benefits of employment: whether the respondent had public housing funding, whether the respondent was enrolled in public pension for employed workers in firms and the government sector (i.e., basic old age insurance or public employee pension), and whether the respondent was covered by public medical insurance for employees (i.e., Urban Employee Basic Medical Insurance or government employee medical insurance). We estimate the effects of military service on three measures of individual social insurance status in panel C of Table 7. The bivariate probit estimates show that military service led to a greater likelihood of having public housing funding, a public pension, and medical insurance for employed workers in firms and the government sector for both the pre-1970 cohorts and the post-1970 cohorts. Thus, for the post-1970 cohorts, despite no observed earnings premium, there was still a positive return to military service in terms of non-observable income.

### *6.4. Sensitivity analysis*

#### *6.4.1. Alternative measures of military service*

In this subsection, we examine the returns to years of military experience and military rank in the off-farm labor market, and explore the robustness of the main results using these two alternative measures of military service.

We first consider years spent in the military. In column 1 of Table 8 the OLS estimate of the return to one additional year of military experience is 2.3 percentage points, which is significant at the 1% level. To address the endogeneity and sample selection, we estimate the system of three equations that includes a tobit for years of military service. The IV estimate in column 2 is also positive but larger in magnitude than the OLS estimate, indicating that selection into the military and sample selection result in underestimates of the association between military service and off-farm earnings. One more year of military experience increased the probability of off-farm work status by 1.2 percentage points and increased off-farm earnings by 4.7%. Turning to the military experience equation, we find that the percentage served in each birth cohort is highly positively correlated with the length of military service. Moreover, the correlation coefficient between the error terms in the log earnings equation and the military experience equation is significant and negative ($\rho\_em = -0.132$), suggesting that there is negative selection into the military forces and the OLS estimate is biased downward.

Next, we analyze whether the main results are robust to the ordinal measure of military rank. In the three-equation model, an ordered probit model is used to estimate the military rank equation. Columns 6–8 of Table 8 show that higher military rank led to a higher likelihood of off-farm work and higher off-farm earnings. The estimated effect of military rank on off-farm earnings is 0.237,

**Table 7**
Heterogeneous effects by cohorts.

| | 1951–1970 | 1971–1987 |
|---|---|---|
| | (1) | (2) |
| Panel A. IV estimates for the three-equation model | | |
| *Model 1. Log off-farm earnings (linear)* | | |
| Military service | 0.570*** | 0.101 |
| | (0.121) | (0.274) |
| *Model 2. Off-farm work (probit)* | | |
| Military service | 0.281*** | 0.469*** |
| | (0.100) | (0.127) |
| *Model 3. Veteran status (probit)* | | |
| Percentage served | 0.523*** | 0.394*** |
| | (0.125) | (0.125) |
| $\rho_{ew}$ | 0.133** | 0.021 |
| | (0.057) | (0.053) |
| $\rho_{em}$ | −0.310*** | −0.089 |
| | (0.072) | (0.140) |
| $\rho_{wm}$ | −0.319* | −0.705** |
| | (0.181) | (0.276) |
| Observations | 4730 | 4947 |
| Panel B. IV/bivariate probit estimates for main channel variables | | |
| Public sector employment | 0.208*** | 0.332*** |
| | (0.048) | (0.033) |
| White-collar work | 0.116*** | 0.252*** |
| | (0.037) | (0.015) |
| Inter-province migration | 0.145*** | 0.044 |
| | (0.032) | (0.068) |
| Current urban *hukou* status | 0.244*** | 0.245*** |
| | (0.059) | (0.070) |
| Party membership | 0.175 | 0.300*** |
| | (0.435) | (0.021) |
| Total cognitive score | 9.117*** | 9.427*** |
| | (1.001) | (1.364) |
| Number of visits by friends | 10.568*** | 12.265*** |
| | (0.849) | (1.193) |
| Panel C. Bivariate probit estimates for nonpecuniary benefits | | |
| Public housing funding | 0.123*** | 0.208*** |
| | (0.043) | (0.032) |
| Public pension for employees | 0.196*** | 0.290*** |
| | (0.056) | (0.041) |
| Public medical insurance for employees | 0.179*** | 0.253*** |
| | (0.054) | (0.034) |

Notes: The significance levels of 1%, 5%, and 10% are denoted by ***, **, and *, respectively. Standard errors clustered at the year-of-birth level are reported in parentheses. Marginal effects are reported for the probit and bivariate probit regressions. All regressions control for years of schooling, marital status, Han ethnicity, age fixed effect, year fixed effect, province fixed effect, ten-year cohort fixed effect, and a linear cohort trend. The exclusive restrictions for the off-farm work equation include number of children, number of elderly, and an indicator of land acquisition.

which is also larger in magnitude than the OLS estimate. Again, we find a negatively significant correlation of the off-farm earnings equation with the military rank equation. This finding is consistent with Hirsch and Mehay (2003), which find a greater wage return to military service for veteran officers than for enlisted personnel.

### 6.4.2. Robustness checks

We now conduct a number of robustness checks using alternate specifications and samples. First, we construct the rural military enrollment rates by birth cohort, using the pooled sample of males with rural *hukou* in childhood based on related survey questions in CGSS 2003 and 2006 and CHARLS 2014. Fig. A2 in the Appendix illustrates that the cohort trends in the military enrollment rates are similar for the national sample and the rural sample, except for the younger cohorts.[29] In column 1 in Table 9, we use the rural enrollment rates as the instrument and find that the results are virtually unchanged.

[29] It is probably because the observations of men with rural *hukou* in childhood are < 100 for the cohorts born after 1973 and even < 50 for the cohorts born after 1982 in the CGSS and CHARLS pooled sample. Thus, the rural enrollment rates for the younger cohorts may have larger measurement errors.

**Table 8**
Effects of military experience and military rank on off-farm earnings and employment.

| | OLS | IV: a three-equation model | | | OLS | IV: a three-equation model | | |
|---|---|---|---|---|---|---|---|---|
| | Log earnings | Log earnings (linear) | Off-farm work (probit) | Military experience (tobit) | Log earnings | Log earnings (linear) | Off-farm work (probit) | Military rank (ordered probit) |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| Years of military experience | 0.023*** | 0.047*** | 0.012*** | | | | | |
| | (0.006) | (0.008) | (0.003) | | | | | |
| Military rank | | | | | 0.040 | 0.237*** | 0.100** | |
| | | | | | (0.028) | (0.060) | (0.043) | |
| Percentage served | | | | 2.264*** | | | | 4.527*** |
| | | | | (0.535) | | | | (0.974) |
| Years of schooling | 0.038*** | 0.038*** | 0.017*** | 0.040*** | 0.039*** | 0.039*** | 0.016*** | 0.078*** |
| | (0.002) | (0.002) | (0.001) | (0.004) | (0.002) | (0.002) | (0.001) | (0.006) |
| Married | 0.133*** | 0.131*** | 0.006 | 0.033 | 0.134*** | 0.131*** | 0.005 | 0.065 |
| | (0.034) | (0.034) | (0.010) | (0.032) | (0.034) | (0.034) | (0.010) | (0.064) |
| Han ethnicity | −0.022 | −0.014 | 0.090*** | 0.075 | −0.019 | −0.011 | 0.089*** | 0.156 |
| | (0.056) | (0.055) | (0.020) | (0.048) | (0.056) | (0.055) | (0.020) | (0.096) |
| Number of children | | | −0.018*** | | | | −0.018*** | |
| | | | (0.004) | | | | (0.004) | |
| Number of elderly | | | −0.012*** | | | | −0.012*** | |
| | | | (0.004) | | | | (0.004) | |
| Land acquisition | | | 0.039*** | | | | 0.039*** | |
| | | | (0.010) | | | | (0.010) | |
| ρ_*ew* | | 0.069** | | | | 0.081** | | |
| | | (0.031) | | | | (0.033) | | |
| ρ_*em* | | −0.132*** | | | | −0.211*** | | |
| | | (0.024) | | | | (0.043) | | |
| ρ_*wm* | | 0.031 | | | | −0.117 | | |
| | | (0.034) | | | | (0.103) | | |
| Observations | 9665 | 9665 | 26,883 | | 9665 | 9665 | 26,883 | |

Notes: The significance levels of 1%, 5%, and 10% are denoted by ***, **, and *, respectively. Standard errors clustered at the year-of-birth level are reported in parentheses. Marginal effects are reported for the probit and tobit regressions in columns 3, 4, and 7, and the coefficients are reported for the ordered probit regression in column 8. All regressions control for age fixed effect, year fixed effect, province fixed effect, ten-year cohort fixed effect, and a linear cohort trend.

Second, our identification strategy is based on cohort-related instruments and may, therefore, depend on the functional form adopted to control for cohort heterogeneities. The main specification in Table 2 controls for a linear cohort trend and ten-year cohort dummies. We assess the robustness of the findings to different specifications of cohort effects using five-year cohort dummies in column 2 and a quadratic cohort trend in column 3 in Table 9. The IV estimates of military service are quite insensitive to the functional form adopted, suggesting that our main specification is satisfactory for capturing cohort heterogeneities.

Third, we control for unrestricted age effects in the earnings equation in our main specification, instead of potential working experience, because this specification is more flexible and the constructed working experience is subject to measurement errors. To check the sensitivity of our results, years of total experience are calculated as age minus years of education minus 6. In column 4 of Table 9, we control for total experience and its squared term in the estimations, and the IV estimates are similar to the main estimates in Table 2.

Fourth, in the main specification, we use the sample with formal or temporary off-farm wage employment for the off-farm earnings equation. Now we restrict the sample to those who reported off-farm wage employment as their primary jobs for the off-farm earnings equation. In column 5 of Table 9, we find that this change has little effect on the results.

Fifth, the aggregate military enrollment rate may not be accurately measured for the cohorts 1982–1987 in CGSS 2003 and 2006, because respondents were probably still in military service and thus might not have been fully surveyed. As a robustness check, we exclude the cohorts 1982–1987 and re-estimate the models. Column 6 of Table 9 shows that the estimated coefficients of military service remain unchanged.

Sixth, we pool multiple waves of the CFPS in the main analyses, and each interview is taken as one distinct observation because individuals' off-farm labor market outcomes may change over time. To test the sensitivity of our results, we re-estimate the models using the first observation for each man. As presented in column 7 of Table 9, the results are very similar to our main results.

If veterans chose to work more (less) days per month or year than non-veterans, our main estimates based on annual wage earnings may overestimate (underestimate) the true returns to military service. CFPS 2010 asked the respondents to report actual months worked in the previous year and the average number of days worked per month.[30] Daily wages are computed by dividing

[30] Waves 2014 and 2016 did not have such survey questions, while wave, 2012 only asked about days worked per month.

**Table 9**
Robustness checks using alternative specifications.

| | Use rural percentage served as IV | Control for 5-year cohort dummies | Control for quadratic cohort trend | Control for exp., $exp^2$ | Main job is off-farm employment | Exclude cohorts 1982–1987 | Keep one obs. For each man | Log(daily wage) | Individual total income |
|---|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
| Panel A. OLS estimates | | | | | | | | | |
| Military service | 0.042 | 0.040 | 0.040 | 0.040 | 0.029 | 0.064 | 0.041 | 0.029 | 0.318** |
| | (0.038) | (0.038) | (0.037) | (0.038) | (0.039) | (0.042) | (0.047) | (0.061) | (0.120) |
| Panel B. IV estimates | | | | | | | | | |
| *Model 1. Log off-farm earnings (linear)* | | | | | | | | | |
| Military service | 0.442*** | 0.437*** | 0.439*** | 0.419*** | 0.452*** | 0.460*** | 0.558*** | 1.112*** | 0.855*** |
| | (0.098) | (0.101) | (0.097) | (0.095) | (0.104) | (0.115) | (0.134) | (0.175) | (0.246) |
| *Model 2. Off-farm work (probit)* | | | | | | | | | |
| Military service | 0.364*** | 0.371*** | 0.362*** | 0.367*** | 0.356*** | 0.352*** | 0.487*** | 0.409*** | – |
| | (0.082) | (0.075) | (0.081) | (0.073) | (0.080) | (0.080) | (0.058) | (0.074) | |
| *Model 3. Military service (probit)* | | | | | | | | | |
| Percentage served | 0.403*** | 0.370*** | 0.334*** | 0.427*** | 0.457*** | 0.442*** | 0.594*** | 0.460*** | 0.470*** |
| | (0.114) | (0.104) | (0.100) | (0.103) | (0.091) | (0.102) | (0.138) | (0.127) | (0.151) |
| ρ_*ew* | 0.089*** | 0.093*** | 0.092*** | 0.086** | 0.135*** | 0.113*** | 0.155*** | 1.084*** | |
| | (0.034) | (0.034) | (0.033) | (0.034) | (0.041) | (0.040) | (0.048) | (0.097) | |
| ρ_*em* | −0.252*** | −0.249*** | −0.250*** | −0.237*** | −0.265*** | −0.250*** | −0.341*** | −0.538*** | −0.093*** |
| | (0.052) | (0.054) | (0.051) | (0.049) | (0.055) | (0.062) | (0.087) | (0.098) | (0.030) |
| ρ_*wm* | −0.474*** | −0.490*** | −0.471*** | −0.480*** | −0.465*** | −0.448*** | −0.706*** | −0.556*** | |
| | (0.158) | (0.146) | (0.153) | (0.138) | (0.155) | (0.153) | (0.130) | (0.158) | |
| Age dummies | Y | Y | Y | N | Y | Y | Y | age, $age^2$ | Y |
| Cohort dummies | Every 10 years | Every 5 years | N | Every 10 years | Every 10 years | Every 10 years | Every 10 years | Every 10 years | Every 10 years |
| Observations | 9677 | 9677 | 9677 | 9677 | 8463 | 7917 | 4565 | 2582 | 14,619 |

Notes: The significance levels of 1%, 5%, and 10% are denoted by ***, **, and *, respectively. Standard errors clustered at the year-of-birth level are reported in parentheses. Marginal effects are reported for the probit regressions. All regressions control for years of schooling, marital status, Han ethnicity, age fixed effect, year fixed effect, province fixed effect, ten-year cohort fixed effect, and a linear cohort trend. The exclusive restrictions for the off-farm work equation include number of children, number of elderly, and an indicator of land acquisition.

annual off-farm earnings by days worked in the previous year. In column 8 of Table 9, the IV estimates are qualitatively similar to the main estimates, although somewhat larger in magnitude.[31]

Lastly, we attempt to estimate the effect of military service on individual total income from farm, self-employment, and off-farm wage employment. We calculate household farm/business income per working-age household member as a proxy for individual farm/business income. In column 9 of Table 9, we estimate the results for the male sample that are household heads or spouses of household heads. The IV estimate shows a similar positive effect of military service on total income, but of somewhat larger magnitude.[32]

## 7. Conclusion

In this paper, we empirically estimate the returns to military service in off-farm wage employment for men of rural origin in China. To identify the causal effect of military service, we employ a recursive model with instrumental variables to account for selection into military service and selection into the off-farm wage employment. Overall, our results suggest that military service is a valuable experience for men of rural origin who might otherwise work in farming and have lower socioeconomic status. Specifically, the veterans of rural origin were 37.7% more likely to participate in the off-farm sector and earned 44.5% more than the comparable non-veterans. These findings are robust to alternative model specifications and sample selections.

Our findings are consistent with previous studies in the United States and Portugal, including Angrist (1998), Hirsch and Mehay (2003), and Card and Cardoso (2012), which find a positive wage impact of military service for relatively disadvantaged men. Our estimated returns to military service for veterans of rural origin are much larger than those found in the above literature using data from developed countries, but comparable in magnitude to the estimated returns to a college education in China. Li et al. (2012) find that the return to a college education relative to junior high school was around 40% in 2000, using twins data in urban China.

[31] Li (2003) find that the estimated returns to education were higher using hourly wages than using annual earnings, because more educated people worked fewer hours on average.

[32] We have also calculated household farm/business income per capita as a proxy for individual farm/business income, and found similar results as presented here.

Correcting for selection bias, Heckman and Li (2004) find that the average treatment effect of a college education was 43% for high school graduates in 2000, whereas Wang (2012) finds that the college premium rose from 38% in 1995 to 88% in 2002. Giles, Park, and Wang (2019) find a return to college of 49.8% using the Cultural Revolution as a natural experiment.

Furthermore, we explore several mechanisms behind the returns to military service for veterans of rural origin. The positive impact of military service is partially explained by the fact that veterans of rural origin are more likely to work in the public sector, have white-collar jobs, migrate across provinces, and convert to urban *hukou*. We also find that rural veterans were more likely to join the Party and had better cognitive skills than non-veterans, suggesting the role of military service in political and human capital accumulation.

Although our results suggest that the impacts of military service on most channel variables do not differ between the pre-1970 and post-1970 cohorts, we find that the positive earnings premium of military service is mainly concentrated among the pre-1970 cohort. For the post-1970 cohort, military service is still an effective bridge to off-farm wage employment, especially public sector and white-collar jobs, *hukou* conversion, and Party membership, and has positive returns when fringe and non-pecuniary benefits are added. In searching for explanations for the decreasing returns to military service across cohorts, we argue that with improved institutional framework in China (e.g., relaxed limitations on capital and labor mobility, and better market opportunities), human capital becomes to dominate in determining one's wage level in the market economy; thus, the role of military service as an upward mobility ladder decays overtime. Rural non-veterans in the post-1970 cohort have had better labor market prospects in the private sector because of its rapid development as well as the significant changes in rural-urban migration in terms of job opportunities and income levels since the mid-1980s. Therefore, to some extent, the time-varying returns to military service exemplify how a poor institution can hurdle potential economic growth and welfare gains.

Our findings have important policy implications for military recruitment and the protection of veterans' benefits in the process of China's military modernization. Our estimates may also provide useful information for other countries that want to fully consider the economic costs and benefits of peacetime military conscription and make regulations accordingly.

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