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台灣兵役役期縮減對役男未來收入之影響

The Impact of R.O.C. Military Service  
on Labor's Future Earnings

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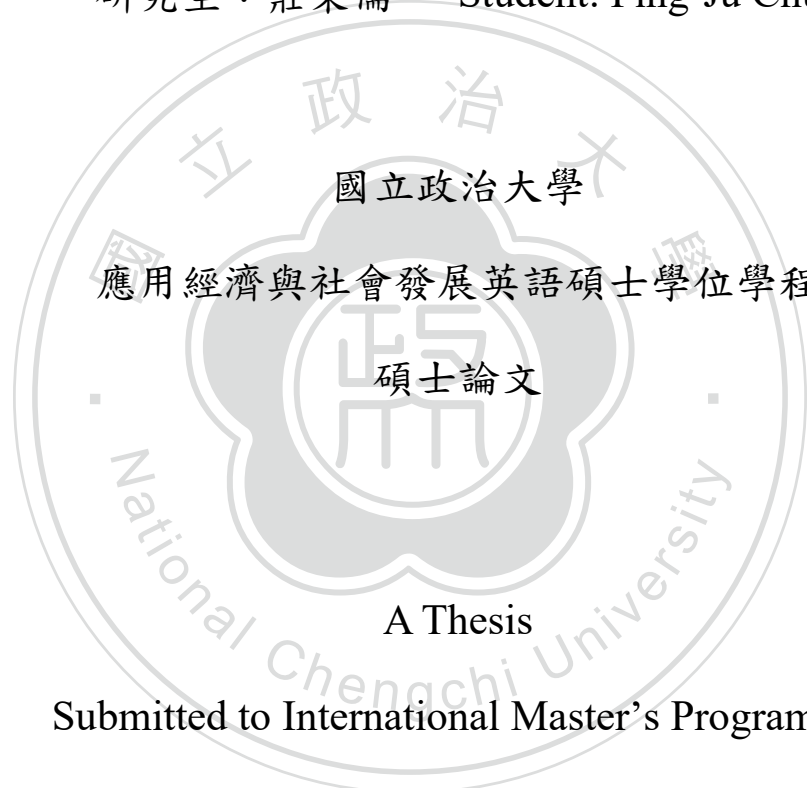
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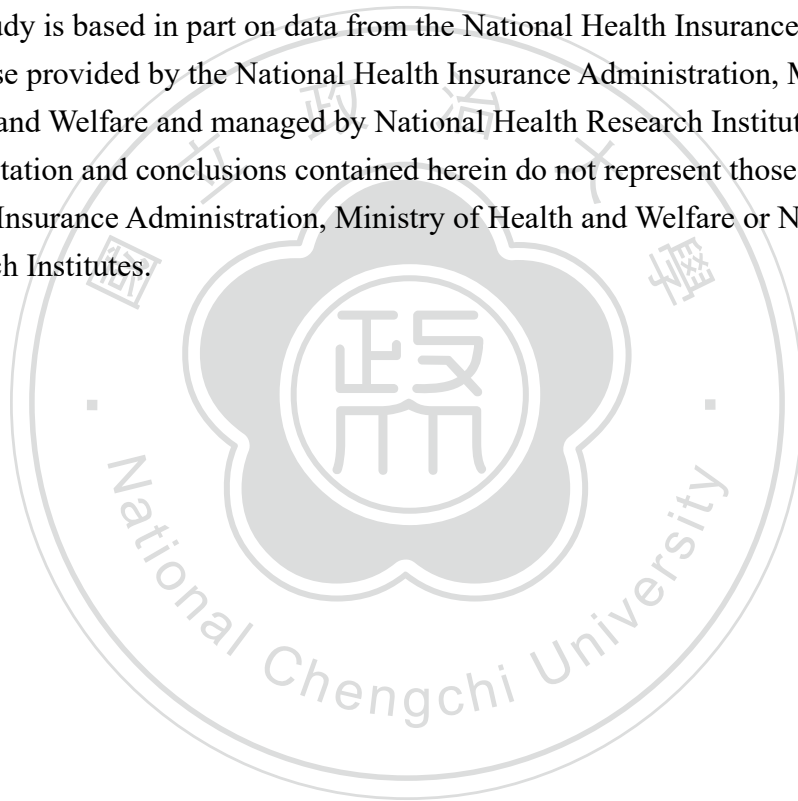
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## Abstract

**Aims and objectives:** To find out the effect of ROC compulsory military service on labors' job search and future earnings.

**Background:** In January 2004, government decided to downsize the scale of compulsory servicemen and shorten their length of service from 22 to 20 months. With a service deduction, servicemen are expected to have a longer period of time on finding a job and receive an increase on income. However, the previous researches indicate that the income effect of CMS could be positive or negative and its influence varies across countries.

**Design and Methods:** RD and RD-DID design are conducted in using National Health Insurance Research Database from 2001-2013. Follow-up on servicemen who finished service from January 2003 to June 2005 is delivered in the study and we compare their service term, job search and future income.

**Results:** Servicemen with 1.74 months of deducted service didn't spend fewer time on job search. Although they accumulated 1.56 more months of working experience 3 years after starting service, the additional experience doesn't have influence on their income of first job. In addition, there's no significant evidence suggesting that their income and the fraction of having a job 3 and 10 years after starting service is different between servicemen served for 22 and 20 months.

**Conclusion:** Service deduction affects labors' future earnings through their job search process. This study suggests that a 2-month service deduction does not have effect on servicemen's future earnings and the fraction of having a job.

### KEYWORDS

Taiwan, military service, job search, future earnings

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# 1 Introduction

The influence of compulsory military service on people's future earnings is a critical issue, especially for those who are attending service. Compared to non-veterans, those who served in military is expected to have less accumulated working experience; moreover, if the skills acquired in military is not helpful when finding a job, their earnings will be even lower. Many studies have been conducted to estimate effects of military service, however, it doesn't seem to have a certain pattern showing whether it has a positive or negative effect. Evidence can be divided into two categories: one is researches studying the income effect of veterans returned from wars and the other is focusing on people served in compulsory military service. For the category of war, J. Angrist & Krueger (1994) conducted research on veterans returned from World War II, which shows their future earnings would be no higher than those who didn't spent time in war. And he further studied white veterans experienced Vietnam War and found their income 10 years after War would be 15% lower than non-veterans' (J. D. Angrist, 1990).

For the category of CMS, the income effect could be negative, positive and no effect. Asali (2015) studied the influence of CMS among Druze men in Israel. For servicemen aged 25 to 34, their income would be 18% higher than non-veterans and for the group aged 35 to 44, the positive effect is 23%. Card & Cardoso (2012) studied CMS in Portugal, for servicemen with higher education, there's no effect on their income, though, it has a positive effect on low education servicemen. Grenet et al. (2011) suggests that for people served for 18 months in UK, there's no effect on their future income. Furthermore, Bauer et al. (2012) has reached to a similar finding in Germany. However, Imbens & van der Klaauw (1995) indicates that there's a 5% negative impact on income of the Netherlands' veterans 10 years after service. In addition, Hubers & Webbink (2015) conducted a similar research in the Netherlands, which shows that there's a 3-4% negative impact lasted for 18 years.

The goal of this study is to measure the effect of a 2-month shortened service on people's job search and future earnings in Taiwan. Compared to most papers studying the effect of CMS by looking at veterans and non-veterans' income, we try to estimate the effect between veterans who served for 22 months and 20 months. The 2-month effect we estimate is relatively smaller than having a 2-year service in other studies. Unlike other papers which use separated files estimating income and service, we apply the enrollee file<sup>1</sup> collected from National Health Insurance Research Database (NHIRD), containing both information and leads to a direct estimation on future influence. In this

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<sup>1</sup>The enrollee file's official name is Registry for Beneficiaries.



research, we don't have to look at the shortened service and its influence on income in each birth cohort. After finding out potential group of people who served in compulsory service, we can directly compare their future income.

In this study, we found servicemen with 1.74 months of service deduction didn't find jobs earlier. Furthermore, the 1.56 more months of working experience accumulated due to a shorter service doesn't lead to an increase on first monthly income in short term nor does in long term when 3 and 10 years after starting service. Moreover, there's no evidence suggesting that the fraction of having a job is different for servicemen served for 22 and 20 months.

Section II introduces the policy backgrounds about Taiwan's military service system and term deduction policy. After January 2004, those who were supposed to retire from service after policy date would be eligible for having a 2-month service deduction. Section III explains how we collect data from NHIRD and apply the enrollee file to find out servicemen whose identity wasn't revealed due to confidentiality rules. In section IV, we introduce the RD design to estimate the change in their service term after policy and apply RD-DID design to deal with the seasonal influence in job market and estimate the policy effect on job search and future earnings. Section V shows the findings and section VI is the part of conclusion and discussion.

## **2 Background**

### **2.1 Draft in Taiwan**

The armed force in Taiwan is composed of voluntary and compulsory service. Both male and female can serve as voluntary soldiers but only male is required to complete compulsory service. In 2000, about 50% of armed forces was made up of compulsory servicemen and the other 50% is voluntary soldiers. The types of compulsory service can be divided into three categories: normal soldier, substitute servicemen, and reserve duty system for technology and science.

Men in Taiwan need to serve in military and they are eligible for being recruited on January 1 after their 18th birthday. Except for people who keep studying, others will have physical and psychological examination before having service. For people whose condition doesn't meet the standard of serving as normal soldiers or having an exemption, they will have substitute service. Only a small fraction of people with certain education degree can serve in reserve duty system. Nonetheless, their length of service exceeds 2 years, which is more than regular and substitute servicemen's duty, hence they aren't included in this study.

## **2.2 Deduction Policies**

The government of Taiwan planned to downscale the military force and raise the proportion of voluntary servicemen around the year 2000. Therefore, they tried to shorten the length of military service and add substitute service as an alternative option to reduce the over amount of compulsory servicemen who couldn't serve on time. The six times deduction policies started from October 1, 1999 and ended on January 1, 2008 (1999/10/1, 2004/1/1, 2005/7/1, 2006/1/1, 2007/7/1, 2008/1/1). The length of service dropped by 2 months after each policy and the total service was lowered from 2 years to 1 year.

In this study, we estimate the effect of the second service deduction policy which was implemented in 2004. The reason that we don't use the other five times of policies is because for the first policy in 1999, there's no available data we can acquire. And for the other four consecutive policies after 2004, we are afraid of that people might have expectation of having another term deduction policy after 2004 because the government, at that time, was resolutely pushing the downscale plans to fulfill the adjustment in defense capabilities and solve the overcrowding issue following from that. Therefore, we adopt the first one in continuous deduction policies to avoid the possibility that people might postpone duty in order to have a shorter service.

## **2.3 Qualification of Having Term Deduction**

Servicemen who were supposed to finish service after January 1, 2004 would be eligible for having a service deduction. For servicemen whose original retirement date is before March 2004, they were all released on January 1 and received a deducted term from 1 day to 2 months. For servicemen who were supposed to retire after March 1, their length of service were cut by 2 months.

# **3 Data and Sample**

## **3.1 Data**

We obtain data from National Health Insurance Research Database, which contains 99% of citizens in Taiwan as the National Health Insurance Act indicates that everyone should be enrolled in health system. In NHIRD, we collect data from January 2001 to December 2013 and apply the enrollee file which contains monthly information of 22 million citizens such as their birthday, condition of insurance, payroll bracket, and relationship with insured. In the enrollee file, there are some restrictions on revealing

certain type of people's identity due to confidentiality rule. For servicemen in military and convicts in correction institutes, their information wouldn't exist and we apply this rule to find out servicemen disappeared from file.

### 3.2 Mechanism of Finding Servicemen

For servicemen in military, they were still insured in national health system, however, their data wouldn't be kept in file. Therefore, we try to pick them up from people who have similar pattern by using following steps.

First, as we know that servicemen and convicts are the only two types of people who weren't in the file. Hence, we check out convicts' insured status and exclude them by dropping those who withdrew from the national health program.

Second, we keep people who disappeared from the enrollee file between 10 to 24 months, which are the maximum length of service in 1999 and minimum length in 2008. Although we aren't using the other 4 policies after 2004, we still don't want to further restrict their term in an extreme interval from 20 to 22 months as the legitimate length around 2004. We hope to create a reasonable interval and capture the deduction in service if it does exist. For voluntary soldiers, though, they weren't in the enrollee file as well, the minimum length of their service is 4 years and they wouldn't be captured by this mechanism. Therefore, we can obtain servicemen and their length of service by calculating the period for the remaining people disappearing from the file.

Third, we drop 2,797 observations who disappeared from 10 to 24 months for more than 1 time as we couldn't identify which time they disappeared is because they were serving in military.<sup>2</sup>

Last, we include servicemen who started service between the age of 19 to 25, which makes sure the group of servicemen we obtain is at their primary age of serving in military so as to increase the possibility of finding out servicemen. As seen in Figure 1 and 2, which are the age distributions of servicemen born in different years. We can notice that the highest proportion for people starting their service is at the age of 20. After that, the number starts to decrease and becomes smooth at 26. People who were excluded can be divided into three groups: (1) people aged 9 to 18 were those insured under parents' unit and they were found owing to the termination of parents' insurance (2) people aged 26 to 36 were those less likely to serve their duty (3) people aged 36-42

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<sup>2</sup>The rule of NHIRD indicates that for people whose insurance stops due to any reason, the missing data between the month they disappeared and returned to the program would be filled up with new status due to retroactive insurance. However, We do not find evidence showing that their data was actually filled up; therefore, there're some people still disappeared from the enrollee file for more than 10 months because they lost their job or due to other reasons which lead to the termination of insurance.

were those disappeared due to termination of insurance.<sup>3</sup>

### 3.3 Number of Servicemen

In this part, we try to provide a comparable number between actual personnel and observations obtained in NHIRD. However, the observations in this study are servicemen retired from January 2003 to December 2005 and the actual personnel is the number of servicemen reported in July each year. Although we aren't able to know how many servicemen served from 2003 to 2005 actually retired during that period, we still want to inform readers about the number of servicemen in each year.

For the number of substitute servicemen, it's reported in the open database provided by the government. From 2003 to 2005, the number of substitute servicemen is 10,083, 11,135 and 14,000. For the number of compulsory servicemen, which isn't revealed, we refer to the book written by a former member of The Control Yuan. In Huang (2017), there's only the number of compulsory servicemen after 2005 provided on page 259. Therefore, we apply the amount of total personnel presented on page 141 and multiply it by 50%, the proportion of compulsory servicemen among all personnel. From 2003 to 2005, the amount of compulsory servicemen is 143,750, 130,625 and 103,585.

The total amount of servicemen reported from 2003 to 2005 is 413,178 and we obtained 342,297 retired from 2003 to 2005. In Figure 3, we present the comparable number. Considering that we exclude 20,423 of observations who were less likely to serve in military from 26 to 36 and 2,797 of observations who disappeared from NHIRD for more than 1 time, the gap between real amount of servicemen and observation we obtained could be even smaller.

### 3.4 Length of Military Service

In this study, we try to identify servicemen in the enrollee file by picking up people who disappeared from health insurance system for 10 to 24 months, the longest and shortest term servicemen might have from 1999 to 2008. In Figure 4, the length of service for servicemen finishing duty from 2003 to 2005 is between 19 and 23 months. The reason that it's wider than the legitimate range from 20 to 22 months is because for servicemen who were in military unit, their data would be excluded from the file. Although they served for 22 months as maximum, some servicemen's insurance information was documented in 23 monthly data. Furthermore, for servicemen who took military education before, their service term could be shortened for 30 days in maximum. Therefore,

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<sup>3</sup>The upper age limit for compulsory service is 36.

some servicemen might have 19 months of service.

Under the setting with a wider range of term to capture servicemen, we still precisely capture their data and obtain very few people serving for 10 to 18 months from 2003 to 2005.

### **3.5 Women's Mocked Service Term**

Due to the constraint of confidentiality rule, servicemen aren't shown in the enrollee file. Therefore, we can only pick up those who have the same pattern as servicemen in the file. However, we are uncertain to the fraction of people found in file actually served in military and we want to know how many people we mistakenly identify as servicemen. Hence, we use the same criteria to capture mocked service term of women, considering that women don't have to serve in compulsory service and, ideally, there should be a small number of women, who stopped their voluntary service, captured by applying this mechanism. Therefore, if men and women's data are processed under the same way, we should have a similar proportion of servicemen mistakenly captured as women found by using this mechanism.

We found that from January 2003 to December 2005, the total amount of women obtained by using this method is 10,777. And the amount of servicemen we obtain is 342,297. Hence, the possibility for us mistakenly identifying people as compulsory servicemen is 3.15%.

### **3.6 Estimation of Income and Job Search**

For the part of earnings, we check for their payroll bracket which indicates the income of insured. For servicemen whose income was less than minimum wage level, their payroll bracket would be notified as minimum wage. After knowing their income, we can further identify their relationship with insured. For people who were independent and had jobs, they became representatives of units insured under companies they worked for. When servicemen's status had been changed into this type, they're considered finding a job and we identify the income of the first job they found after retiring from service as their first job's income.<sup>4</sup>

As soon as servicemen finished their duty, we try to track their job search process. For example, we want to know how long did it take to find their jobs and how much did

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<sup>4</sup>In this research, we apply income data from 2003 to 2013. The minimum level of payroll bracket is the minimum income and it was NTD 15,840 in 2003. After few years, it was increased to NTD 19,047 in 2013. The maximum level in 2003 was NTD 83,900 and it became NTD 182,000 in 2013. The interval between each payroll bracket is from NTD 600 to NTD 6,400, which varies in each amendment of law.

they earn. For servicemen whose status showed that they had jobs right after finishing service, we consider they spent 0 month on finding jobs. In this study, we set a maximum time on finding jobs. For people who spent more than 12 months on searching jobs, they would be considered spending 13 months. The reason of having this setting is because for servicemen on the left to the cutoff, they had relatively more time on finding a job, which means the fraction of them having a job would be higher. Besides, if we don't set a maximum time on job search, there's no measurement on time of job search for those who didn't find a job and this would lead to an underestimation on job search.

After knowing when they found their first job, we compare their working experience accumulated 3 years after starting service. For servicemen who found jobs earlier, they are expected to obtain more experience. For the part of earnings, we observe their income from first job to 10 years after starting service. For the first job's income, since we set 1 year as the maximum time of finding a job, for those who found a job 1 year after finishing service, their first job's income would be 0. Therefore, the definition of their first job becomes the first job they found within a year after service. And for servicemen who didn't work 3 or 10 years after starting service, their income is 0 as well.

Due to the concern of income filed from servicemen insured under an occupational union, we compare the results excluding people whose insured units are occupational union, fishermen and farmer's association in section V.<sup>5</sup>

### 3.7 Sample

In this research, we apply two methods to estimate the effect of policy. The RD design in this research compares servicemen retired before and after January 1, 2004. To reach the effect of having a 2-month deduction, we use the individual finishing service from January 2003 to January 2005 and obtain 244,288 observations. However, for servicemen who were supposed to retire on January or February in 2004, they received a service deduction less than 2 months because they all retired on the policy day and if their original retirement date is closer to policy date, they have a fewer deduction. Therefore, we do not include 24,876 men retired on January considering that some of them received an uneven length of deduction from 1 day to 2 months. For servicemen on the right and left to the cutoff, we have observations retired in 12 months on each side and the total number of servicemen is 219,412.

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<sup>5</sup>The insured units that have been excluded are listed on page 4 in the code-book of NHIRD and start from 13N to 32.



The RD-DID design also compares servicemen retired before and after January 2004. However, we further include data around January 2005 as control group without deduction policy to exclude the seasonal influence on outcome and shorten the bandwidth from 1 year to 6 months. The data starts from July 2003 to June 2005 and we have 227,485 observations. As the same setting in RD design, we drop observations retired in January 2004 and 2005, which equals 31,147 and the amount of observation in RD-DID design is 196,338

### 3.8 Descriptive Statistics

In Table 1, the two columns present means of observations on the right and left to the cutoff of each variable in RD design. We can see, on average, the length of term dropped by 1.7 months, from 21.76 months to 20 months. It shows the observations we obtain are servicemen because the pattern of deduction in term follows the policy. Moreover, servicemen started service closed to the age of 21 and finished at age of 22.8. The gap between age of starting and finishing service for servicemen on the right to the cutoff is smaller, which supports the shorter average term we find above.

In job search, for servicemen with a shorter service, they averagely spent 0.49 fewer months on finding jobs and earned NTD 880 more on first monthly income. 3 years after starting service, they accumulated 1.87 more months of working experience and earned NTD 2,171 more. In addition, the fraction of having a job increased by 5 percentage points. 10 years after starting service, they earned NTD 1,221 more and the fraction of having a job increased by 1 percentage point.

In Table 2, the four columns present means of observations on the right and left to the cutoff in groups with and without deduction policy in RD-DID design. When it comes to the length of service, it dropped from 21.84 months and became smooth around 20 months after January 2004. For servicemen retired after January in 2004 and 2005, they found jobs 1.4 to 1.5 months earlier and received NTD 4,000 to 5,000 on income of first job. 3 years after starting service, 10 more percentage points of servicemen retired from February to June had a job than those retired from July to December. Furthermore, they received NTD 5,694 more in 2004's RD and NTD 6,965 in 2005's RD. 10 years after starting service, about 5 to 8 more percentage points of servicemen retired after January in 2004 and 2005 had a job and they received NTD 8,060 more in 2004's RD and NTD 11,579 more in 2005's RD. Therefore, this indicates that there's a seasonal influence which is in favor of job seekers finding jobs after January in Taiwan. And we try to eliminate seasonal effect by comparing results found in 2004 and 2005.<sup>6</sup>

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<sup>6</sup>The income effect in this study contains jobless people. A larger fraction of people having a job

### 3.9 Age Distribution Around Cutoff

In Table 1 and Table 2, the average age of group on the right is greater than servicemen on the left to the cutoff, which indicates that the age composition of servicemen is different when starting and finishing service. Therefore, we look at servicemen's age of starting service in Figure 5 and find that the average age of servicemen retired after policy is greater than those retired before. Thus we control their age of starting service as shown in Figure 6.

In order to know what leads to different age composition, we divide servicemen into 2 groups: (1)19-21 (2) 22-25 in Figure 7. And we find that each group has a different serving pattern. After January, the number of servicemen in younger group decreases and the average age increases because there's a larger amount of older servicemen. When we have different fraction of age cohort finished service in different seasons, we aren't able to make sure that the effect we observe is due to deduction policy or age distribution. Therefore, we try to decompose the effect by further controlling their age of entering military in the following sections.

## 4 Empirical Strategy

### 4.1 RD Design

$$y_i = \alpha + \beta Deduction2004_i + f(a_i) + v_i \quad (1)$$

Servicemen who were supposed to be released after January 1, 2004 are eligible for having a 2-month term deduction and the length of service dropped from 22 months to 20 months.  $y_i$  is the outcome variable which includes their length of service, duration of job search, and future earnings.  $\alpha$  indicates outcome variables' baseline level of servicemen without deduction.  $Deduction_i$  is a treatment dummy which indicates servicemen whose original retirement date was after January 2004 and the individual was eligible for having service deduction.  $f(a_i)$  is a function of month retired combined with the interaction term of treatment and month retired.<sup>7</sup>  $v_i$  is the error term which includes the influence of other factors on the outcomes.

In RD design, the interest is in  $\beta$ , which captures the change of service, job search duration and future earnings before and after the service deduction. Moreover, we might enlarge the difference in their income.

<sup>7</sup>We apply a linear function:  $f(a_i) = \gamma_1(m - c_{2004}) + \gamma_2 Deduction2004_i(m - c_{2004})$ .  $c_{2004}$  is the cutoff indicating the month when policy was implemented



choose the longest possible window, 12 months, as bandwidth and apply a parametric estimation. The goal of RD design is to provide the basic structure on estimating deduction policy. We discuss the problem of age composition and provide outcome mixed up with policy and seasonal effect under this design.

## 4.2 RD-DID Design

$$y_i = \alpha + \kappa_1 Deduction2004_i + \kappa_2 T_i + \kappa_3 T_i \times Deduction2004_i + g(a_i) + \varepsilon_i \quad (2)$$

In order to eliminate seasonal factors which may affect outcomes generated in using RD design, we try to compare RD's result from deduction policy in January 2004 and the result generated from control group in January 2005. The assumption is that after January, the job market in Taiwan is favorable to job seekers; therefore, workers would be able to spend fewer time on job search and receive higher future earnings. After subtracting the RD's effect in 2005, the RD-DID results would be considered as the effect of service deduction policy.

$Deduction_i$  is still a treatment dummy which equals 1 if servicemen retired from February to June in 2004 and 2005.  $T_i$  indicates servicemen who were in the treatment group and retired from July 2003 to June 2004.  $f(a_i)$  is a linear function of month retired which interacts with  $Deduction_i$  and  $T_i$ .<sup>8</sup>  $v_i$  is the error term including the influence of other factors on the outcomes. In this design,  $T_i \times Deduction2004_i$  is the variable representing servicemen retired after January in the year with deduction policy. And its coefficient  $\kappa_3$  indicates the effect of deduction policy, after excluding seasonal factors in job market.

## 4.3 Identifying Assumption

In Taiwan, the only way for servicemen to defer military service is to keep studying in school. After finishing their education, they wait for entering service. However, the starting date is random and they couldn't decide when to start or retire from service, which is the qualification of having a deduction. As seen in Figure 8, we can notice that the number of servicemen retired around the policy is smooth in each month except for January, the month of policy. The reason that the number in January is three times as in other months is because servicemen who were supposed to retire in January and February would be released on January 1. In addition, for those who were supposed

<sup>8</sup>We apply a linear function:  $g(a_i) = \gamma_1(m - c_{2004}) + \gamma_2 Deduction2004_i(m - c_{2004}) + \gamma_3 T_i \times (m - c_{2004}) + \gamma_4 T_i \times Deduction2004_i(m - c_{2004})$

to retire in March, they were released in January as well. Therefore, as the amount of servicemen doesn't decrease before the policy or increases in the month other than January, we can make sure that servicemen couldn't manipulate the chance of having a 2-month service deduction.

## 5 Estimation Results

### 5.1 Service Term and Job Search

Figure 9 shows that the average length of service dropped from 22 months to 20 months. Furthermore, the service term would be slightly shorter if there's a higher proportion of older servicemen. For servicemen who started service older than the age of 22, they are more likely to graduate from college and have military education course, giving them another term deduction less than one month. And this explains why we can observe an increase in average length of service when the number of older servicemen decreases. In Figure 10, after controlling their age of starting service, the pattern we found disappears and the average length of service becomes smooth.

The residual plots from Figure 11 present the outcome in RD-DID design. Each bin in the figure indicates the mean of service in that month. In Figure 11 and Figure 12, we can notice that service deduction policy is clearly captured and for those who finished service after January 2004, their term is shortened by 1.5 to 2 months, controlling for age of entering service. And the average term doesn't change much in January 2005 because there was no term deduction policy.

From Figure 13 to 16, for those who served 2 fewer months and retired after January 2004, it took them 1 to 1.5 less months to find their first job; however, for servicemen retired after January 2005, they found their first job 1 month earlier even there was no deduction policy. Hence, the policy effect on finding jobs earlier would be smaller after subtracting the seasonal influence. For the working experience they accumulated 3 years after starting service, servicemen with shorter term had 2.5 more months of working experience. Nonetheless, for servicemen retired after January 2005, they also accumulated 1 more month of working experience. Therefore, after excluding the seasonal effect, the service deduction policy increases their working experience by 1.5 months.

In this study, we control servicemen's age of starting duty and cluster the month they retired from service. Table 3 presents the effect of service deduction policy on service, time of finding first job and working experience accumulated 3 years after starting service. The first column shows the effect generated using RD design and the

other four columns present results using RD-DID design. Column (1) shows linear function of RD estimate with 12 months of bandwidth and we further control their living city before having service. The result indicates that servicemen retired after January 2004 served 1.84 fewer months and found jobs 1.35 months earlier. Moreover, they accumulated 2.96 more months of working experience. Column (2) presents the RD-DID estimate with 6 months of bandwidth. The result shows that after subtracting the seasonal effect, the length of service still dropped by 1.74 months and it's because there was no other term deduction in January 2005. For job search, servicemen with a term deduction found jobs .34 months earlier but it's insignificant, which means that servicemen spent 1.35 fewer months on finding jobs in 2004's RD is because there were more job vacancies after January, which was in favor of job seekers as shown in Figure 28. Furthermore, they accumulated 1.56 more months of working experience, which mainly comes from the 1.74 months of shorter service. Column (3) and (4) respectively presents the effect using a shorter bandwidth and excluding servicemen whose insured unit was occupational union. The result shows that the deduction in length of service is still more than 1.7 months and the effect of time spent on job search is also insignificant. However, the working experience decreases .3 months and becomes less significant when we exclude servicemen insured under occupational union. Column (5) indicates the RD-DID effect under a quadratic function. We can see that the length of term dropped by 1.86 months, which is larger than using a linear function. In addition, the effect of time spent on job search is insignificant as in other settings. The working experience becomes fewer but it's still more than 1 month.

## 5.2 Future Income

In Figure 17 and Figure 18, Servicemen retired after January 2004 and 2005 received an income increase over NTD 2,500 on first job's income. 3 years after starting service, they earned around NTD 2,000 more than those retired from July to December as seen in Figure 19 and Figure 20. In Figure 21 and Figure 22, the fraction of having a job increased by 2 percentage points in 2004's RD and 1 percentage point in 2005's RD. In addition, the seasonal effect on income become greater 10 years after starting service, for servicemen retired from February to June in 2004 and 2005, their income is NTD 5,000 more than those retired from July to December as seen in Figure 23 and Figure 24. In Figure 25 and Figure 26, the fraction of having a job increased by 3 percentage points in 2004's RD and 4 percentage points in 2005's RD.

Table 4 presents the effect of service deduction policy on income of first job, income and fraction of having a job 3 and 10 years after starting service. Column (1)

shows that for servicemen retired after January 2004, they earned NTD 2,224 more on first job's income. 3 years after starting service, they received a NTD 2,027 increase on monthly income and there were 3 more percentage points of servicemen found a job. 10 years after starting service, they received a NTD 2,609 increase on monthly income but the effect becomes less significant and there's no significant difference between their fraction of having a job. In column (2), RD-DID estimate with 6 months of bandwidth is used to eliminate the seasonal influence in job market. The result shows that after subtracting the effect of 2005's RD, servicemen earned NTD 540 more on first job's income but it's insignificant. 3 years after starting service, they had a NTD 383 increase on monthly income and there were 1.7 more percentage points of them found a job, however, the effects are insignificant as well. 10 years after starting service, servicemen with a shorter service earned NTD 743 more and there was 1 less percentage point of servicemen found a job and the effects are still insignificant. From column (3) to column (5), we respectively shorten the length of bandwidth, exclude servicemen insured under occupational union and apply a quadratic function. However, the results all show that the service deduction policy has no effect on income of first job, income and fraction of having a job 3 and 10 years after starting service.

## **6 Conclusion and Discussion**

### **6.1 Conclusion**

The compulsory military system has long been studied in different countries and its effect on labor's future income is controversial. In other researches, they compare veterans and non-veterans' future earnings. For the veterans, they mostly served for more than 18 months, however, the observations in this study are all veterans and we estimate the future income of servicemen who served for 22 months and 20 months. In this study, we apply National Health Insurance Research Database, which contains both income and service data, and try to explain the effect of service deduction on labor's job search and future earnings by using RD and RD-DID design.

For the outcomes generated using RD-DID design, we find that service deduction policy cut service term by 1.74 months. After finishing service, veterans with deduction didn't find jobs earlier but because they served 1.74 fewer months, they accumulated 1.56 more months of working experience. Nonetheless, the additional working experience doesn't have influence on their future income and the fraction of having a job.

## 6.2 Limitation

The database we apply in this study is under the constraint of confidentiality rule, which doesn't allow us to directly know the identity of servicemen. Therefore, we cannot perfectly obtain all servicemen in the military and unfortunately lose some observation in order to increase the possibility of having people who were more likely to serve around the policy.

## 6.3 Discussion

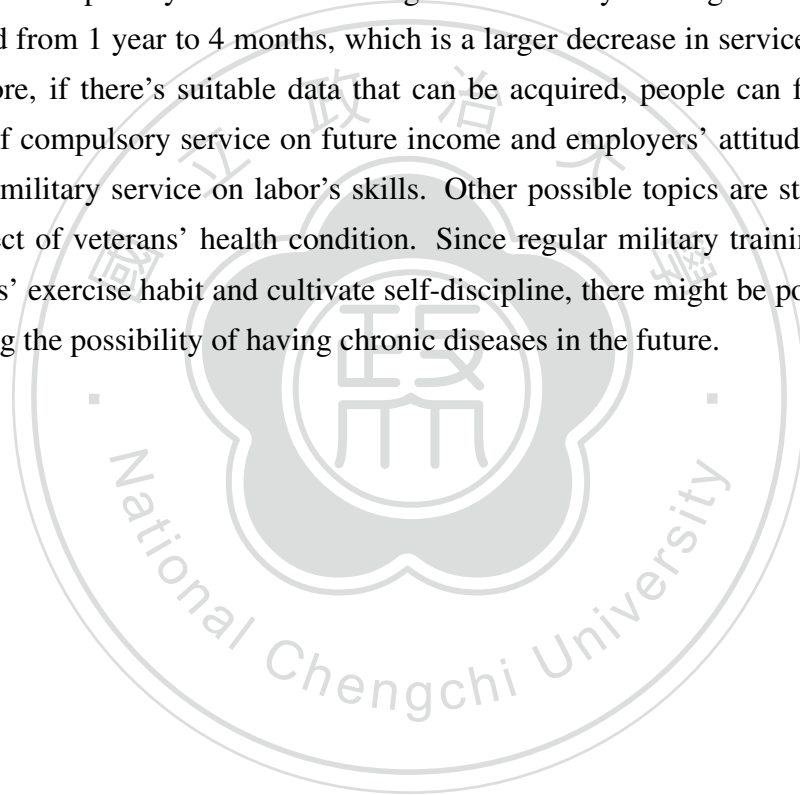
This paper suggests that 1.74 months of deduction in service leads to 1.56 months increase in working experience. However, the shortened service doesn't have effect on time of finding jobs. In addition, the increased experience doesn't affect their future income and the fraction of having a job in short or long term.

Nevertheless, the way we estimate serviceman's income is worth of discussing. The income of those who didn't work were considered as 0 and this would affect the results when there's a different fraction of people working around the cutoff. The reason that we put 0 on people's income for those who didn't have a job is because it includes the effect of whether they found a job. If we consider those without a job as a missing unit, we are estimating the income effect on people who have a job, which would be more reasonable if we merely want to know the change in scale of income. However, this would also lead to a problem. For servicemen on the left to the cutoff, the fraction of them having a job is lower due to seasonal factors and because their income is deemed as missing; therefore, we would underestimate the effect of policy.

In conclusion, when estimating effect of RD in this study, it might be better to consider jobless worker's income as missing. For RD in 2004, we've known that there's more people who retired after January found a job. And if we choose to estimate the income effect with jobless men, then we won't be able to know the income effect on people who have a job. The effect we found, here, is the income effect plus the effect on the fraction of having a job. However, if we choose to estimate income without including jobless men, then we will have two decomposed effect on income. For those retired after January 2004 and had a job, their first job's income is NTD 1,015 higher than those without deduction ( $P < .05$ ). 3 years after starting service, servicemen with jobs earned NTD 1,651 more ( $P < .05$ ) and for those who didn't have a job, there's 3 more percentage points of them found a job due to seasonal effect. 10 years after starting service, servicemen with jobs earned NTD 2,249 more ( $P < .1$ ) and there's no significant difference in the fraction of having a job between servicemen retired before and after January 2004.

Nevertheless, when estimating using RD-DID, we should better include jobless workers because there's no effect on the fraction of having a job and we are estimating the effect of policy through their job search process. Therefore, each way to deal with jobless people's income might be used under certain purpose. However, in this study, we mainly focus on the results representing the effect of deduction policy using RD-DID design instead of trying to know what's the seasonal influence on workers' income from short term to long term using RD design. Hence, we include jobless workers in both RD and RD-DID designs to create a unified income estimation.

Except for the continuous deduction policies from 1999 to 2008, we suggest further studies can be conducted to discuss the service change in ROC military. After 2013, the compulsory service was changed into military training and the length of duty dropped from 1 year to 4 months, which is a larger decrease in service than this study. Therefore, if there's suitable data that can be acquired, people can further study the effect of compulsory service on future income and employers' attitude to the value of having military service on labor's skills. Other possible topics are studies estimating the effect of veterans' health condition. Since regular military training may improve veterans' exercise habit and cultivate self-discipline, there might be positive impact on lowering the possibility of having chronic diseases in the future.





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## Table

Table 1: Descriptive Statistics of RD Sample

	Before January 2004	After January 2004
Service Term(Month)	21.76 (2.06)	20.05 (1.68)
Age of Starting Service(Year)	21.06 (1.62)	21.29 (1.66)
Age of Retiring From Service(Year)	22.87 (1.58)	22.96 (1.63)
Lived in Taipei While Starting Service	0.08 (0.28)	0.09 (0.29)
Time of Finding Jobs	5.19 (5.22)	4.70 (5.19)
Age of Finding First Job(Year)	23.48 (1.76)	23.45 (1.73)
First Job's Income	16,133.52 (11,004.90)	17,014.36 (11,181.46)
Income (3 Years After Starting Service)	15,986.36 (13,117.72)	18,157.78 (13,747.32)
Working Experience (3 Years After Starting Service)	8.75 (5.89)	10.62 (6.40)
Fraction of Having a Job (3 Years After Starting Service)	0.67 (0.47)	0.72 (0.45)
Income (10 Years After Starting Service)	28,151.14 (19,704.06)	29,372.19 (19,962.62)
Fraction of Having a Job (10 Years After Starting Service)	0.85 (0.36)	0.86 (0.35)
Number of observations	110,397	109,015

*Notes:* This table shows the means of variables from sample and standard deviations are in parentheses. Column (1) indicates means on the left to the cutoff and Column (2) indicates means on the right to the cutoff. Data in RD design starts from January 2003 to January 2005.



Table 2: Descriptive Statistics of RD-DID Sample

	Treatment		Control	
	2003 July-Dec.	2004 Feb.-June	2004 July-Dec.	2005 Feb.-June
Service Term(Month)	21.84 (2.29)	19.73 (1.66)	20.33 (1.62)	19.96 (1.42)
Age of Starting Service(Year)	20.93 (1.54)	22.17 (1.50)	20.48 (1.34)	22.39 (1.41)
Age of Retiring From Service(Year)	22.75 (1.53)	23.81 (1.49)	22.17 (1.31)	24.06 (1.40)
Lived in Taipei				
While Starting Service	0.09 (0.28)	0.11 (0.31)	0.07 (0.26)	0.11 (0.31)
Time of Finding Jobs	5.45 (5.27)	4.06 (4.89)	5.31 (5.40)	3.77 (4.80)
Age of Finding First Job(Year)	23.37 (1.70)	24.25 (1.58)	22.66 (1.48)	24.39 (1.46)
First Job's Income	15,288.06 (10,448.64)	19,437.83 (11,453.20)	14,571.31 (9,926.39)	19,913.60 (11,486.24)
Income (3 Years After Starting Service)	15,163.08 (12,449.64)	20,856.77 (14,414.67)	15,337.64 (11,953.44)	22,302.27 (14,404.96)
Working Experience (3 Years After Starting Service)	8.39 (5.96)	11.63 (6.10)	9.67 (6.54)	11.78 (5.91)
Fraction of Having a Job (3 Years After Starting Service)	0.66 (0.47)	0.76 (0.43)	0.69 (0.46)	0.79 (0.41)
Income (10 Years After Starting Service)	26,625.55 (17,595.16)	34,685.15 (21,268.58)	24,106.70 (15,872.43)	35,686.19 (20,935.36)
Fraction of Having a Job (10 Years After Starting Service)	0.84 (0.36)	0.89 (0.31)	0.82 (0.38)	0.90 (0.30)
Number of observations	48,768	49,985	52,759	44,826

*Notes:* This table shows the means of variables from sample and standard deviations are in parentheses. Column (1) and (3) indicate means on the left to the cutoff and Column (2) and (4) indicate means on the right to the cutoff. Data in RD-DID design starts from July 2003 to June 2005.

Table 3: The Effect of Deduction Policy on Service Term and Job Search

	(1)	(2)	(3)	(4)	(5)
<b>Panel A: Term</b>					
<i>Deduction2004</i>	-1.843*** (0.113)				
<i>T × Deduction2004</i>		-1.744*** (0.151)	-1.778*** (0.275)	-1.712*** (0.141)	-1.858*** (0.233)
Baseline Mean			21.84		
Sample size	219,412	196,338	150,952	181,722	196,338
<b>Panel B: Time of Finding Jobs</b>					
<i>Deduction2004</i>	-1.348*** (0.278)				
<i>T × Deduction2004</i>		-0.342 (0.449)	-0.140 (0.469)	-0.258 (0.466)	0.0710 (0.413)
Baseline Mean			5.45		
Sample size	219,412	196,338	150,952	181,722	196,338
<b>Panel C: Working Experience (3 Years After Starting Service)</b>					
<i>Deduction2004</i>	2.956*** (0.319)				
<i>T × Deduction2004</i>		1.558** (0.567)	1.306** (0.599)	1.203* (0.587)	1.094** (0.516)
Baseline Mean			8.39		
Sample size	219,412	196,338	150,952	173,110	196,338
RDD	Yes	–	–	–	–
RDD+DID	–	Yes	Yes	Yes	Yes
Non-union	–	–	–	Yes	–
Covariates	Yes	–	Yes	Yes	Yes
Poly. model	Linear	Linear	Linear	Linear	Quadratic
Bandwidth (months)	12	6	4	6	6

Standard errors in parentheses

\*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

*Notes:* Column (1) shows the estimated coefficients on Deduction in equation (1). Column (2) to column (5) respectively shows the coefficients in equation (2), controlling their age of starting service and cluster their retiring month. The outcome variables are the length of service (Panel A), time spent on finding first jobs (Panel B), and the working experience accumulated 3 years after starting service (Panel C). Column (1) displays RD estimations using linear function controlling the city they lived before starting service. Column (2) to (4) applies RD-DID design with different length of bandwidth and exclude servicemen who were insured under occupational union. Column (5) indicates outcome using quadratic function.

Table 4: The Effect of Deduction Policy on Future Earnings

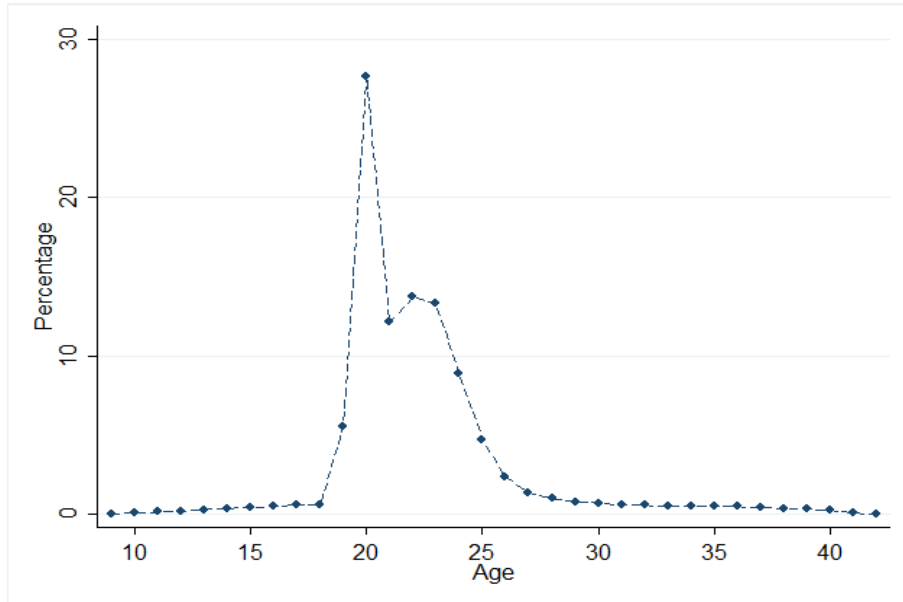
	(1)	(2)	(3)	(4)	(5)
<b>Panel A: First Job's Income</b>					
Deduction2004	2224.0*** (675.0)				
$T \times \text{Deduction2004}$		540.0 (842.8)	260.3 (821.5)	418.5 (862.2)	-40.92 (674.2)
Baseline Mean			15,288		
Sample size	219,412	196,338	150,952	181,722	196,338
<b>Panel B: Income, 3 Years After Starting Service</b>					
Deduction2004	2026.5*** (683.7)				
$T \times \text{Deduction2004}$		383.0 (877.6)	416.7 (785.3)	288.8 (916.3)	399.3 (679.2)
Baseline Mean			15,163		
Sample size	209,554	184,641	141,602	173,110	184,641
<b>Panel C: Fraction of Having a Job (3 Years After Service)</b>					
Deduction2004	0.0321** (0.0146)				
$T \times \text{Deduction2004}$		0.0170 (0.0186)	0.00450 (0.0197)	0.0105 (0.0190)	-0.00845 (0.0205)
Baseline Mean			0.66		
Sample size	209,554	184,641	141,602	173,110	184,641
<b>Panel D: Income, 10 Years After Starting Service</b>					
Deduction2004	2608.6* (1373.9)				
$T \times \text{Deduction2004}$		742.5 (792.3)	921.0 (587.0)	700.7 (867.8)	439.5 (658.7)
Baseline Mean			26,625		
Sample size	209,309	186,739	143,456	162,026	186,739
<b>Panel E: Fraction of Having a Job (10 Years After Service)</b>					
Deduction2004	0.0133 (0.0143)				
$T \times \text{Deduction2004}$		-0.0101 (0.00897)	-0.00885 (0.00922)	-0.0127 (0.0114)	-0.00824 (0.0143)
Baseline Mean			0.84		
Sample size	209,309	186,739	143,456	162,026	186,739
RDD	Yes	-	-	-	-
RDD+DID	-	Yes	Yes	Yes	Yes
Non-union	-	-	-	Yes	-
Covariates	Yes	-	Yes	Yes	Yes
Poly. model	Linear	Linear	Linear	Linear	Quadratic
Bandwidth (months)	12	6	4	6	6

Standard errors in parentheses  
 \*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

Notes: Column (1) shows the estimated coefficients on Deduction in equation (1). Column (2) to column (5) respectively shows the coefficients in equation (2), controlling their age of starting service and cluster their retiring month. The outcome variables are first monthly salary (Panel A), income received 3 years after starting service (Panel B), income received 10 years after starting service (Panel D), and the fraction of having a job (Panel C and E). Column (1) displays RD estimations using linear function controlling the city they lived before starting service. Column (2) to (4) applies RD-DID design with different length of bandwidth and exclude servicemen who were insured under occupational union. Column (5) indicates outcome using quadratic function.

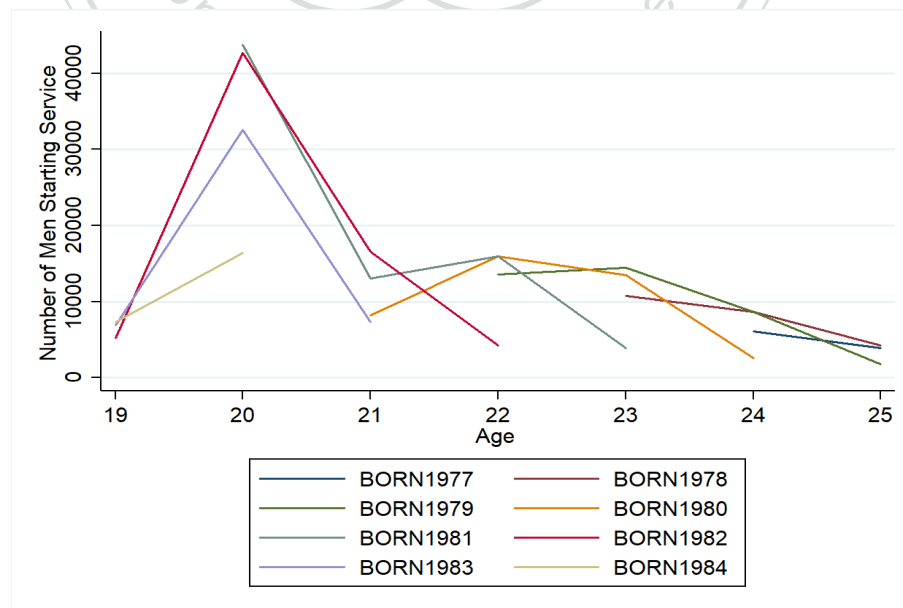
# Figure

Figure 1: Age Distribution



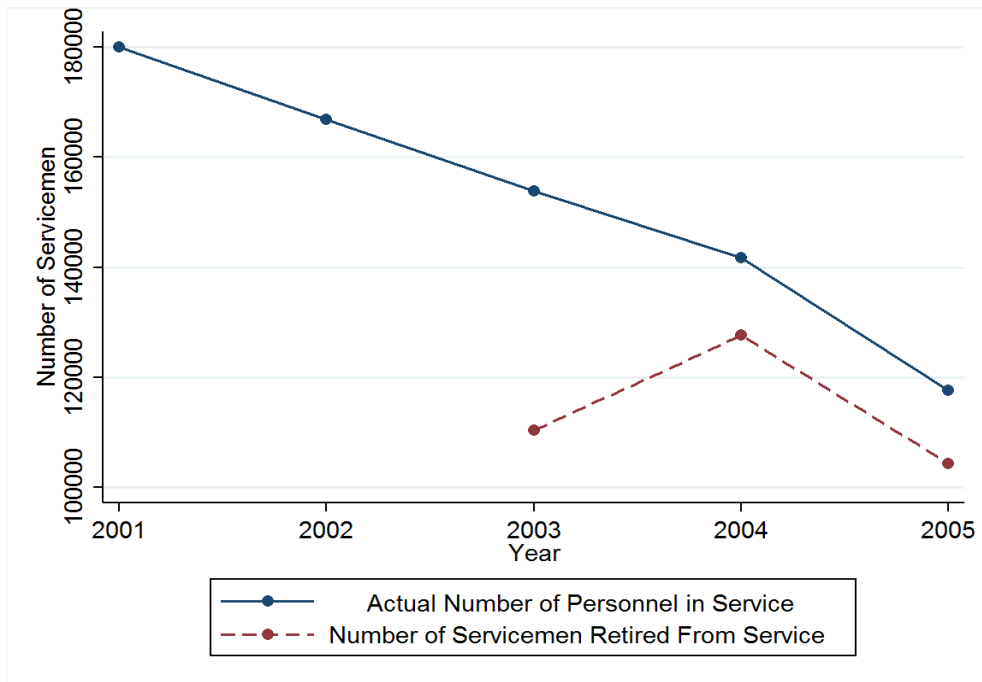
*Notes:* This figure shows the percentage of age when servicemen started their service. The eligible age of having compulsory service is from 19 to 36. And we include servicemen who started service at their primary age between 19 to 25 so as to increase the possibility of finding out servicemen.

Figure 2: Age Distribution in Each Birth Cohort



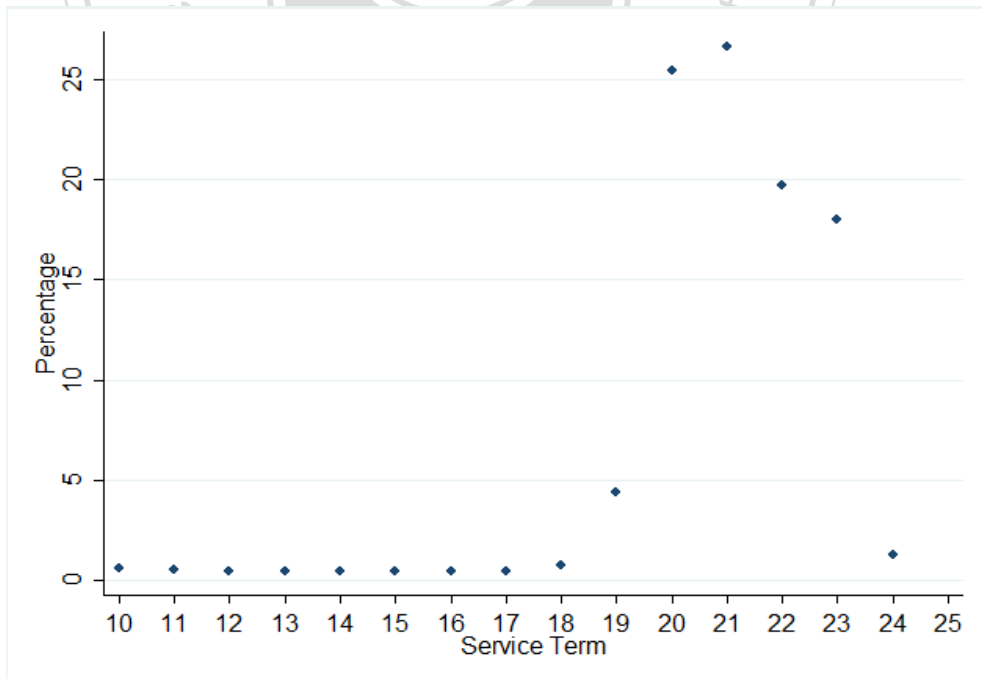
*Notes:* This figure shows the number of servicemen born in different years and their age of starting service. For servicemen born in each cohort, they mostly served at the age of 20 and the number starts to decrease.

Figure 3: Number of Servicemen



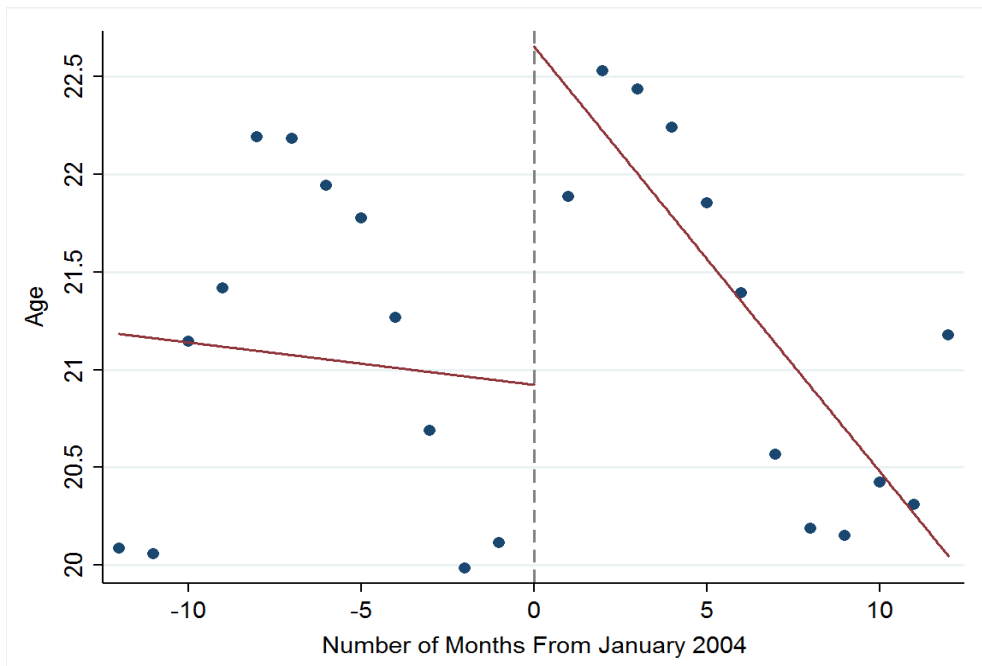
*Notes:* This figure shows the number of actual personnel, which contains regular and substitute servicemen reported in July each year, against the number of observation in NHIRD.

Figure 4: Fraction of Each Service Term



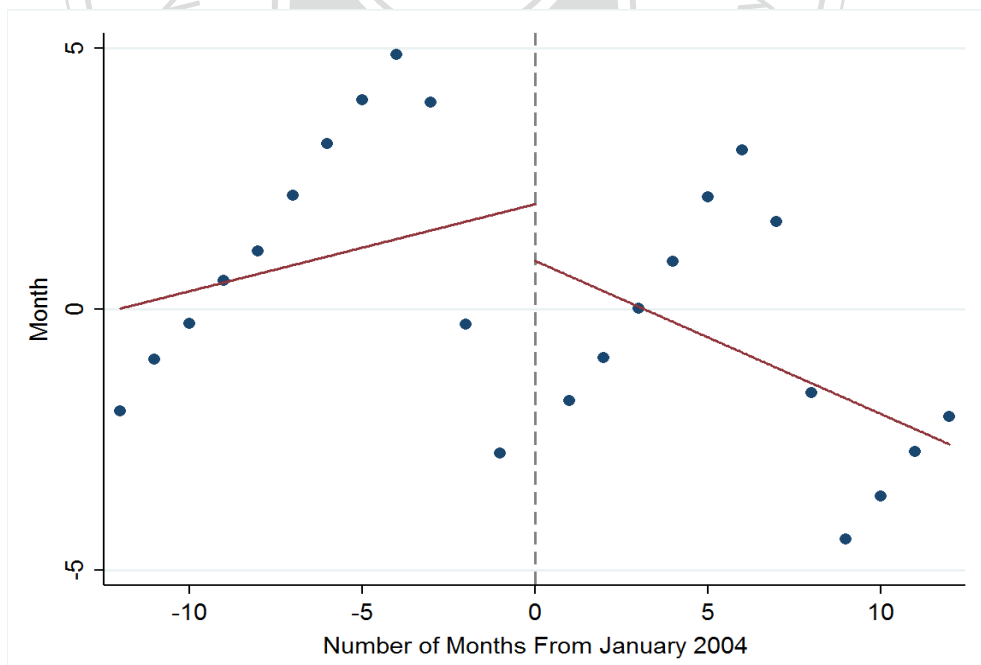
*Notes:* This figure presents the percentage of each service term. In this study, we set a wider range to capture servicemen in NHIRD and find that very few of them had unreasonable length of service.

Figure 5: Age of Starting Service



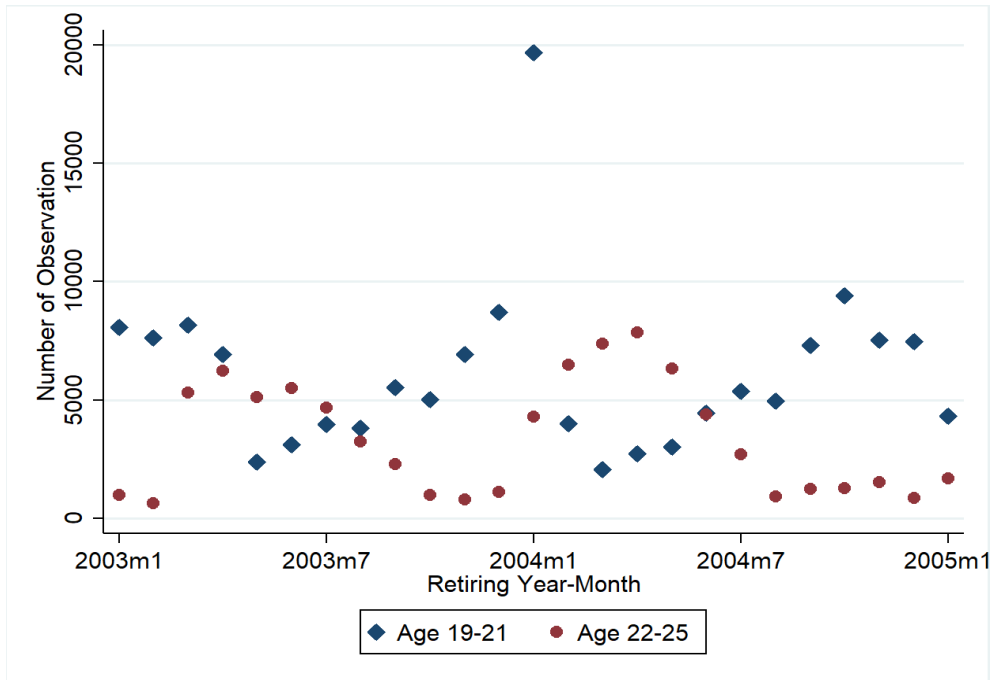
Notes: This figure shows the average age of servicemen retired around January 2004. The retirement age on the right to the cutoff is 1.5 year greater than servicemen on the left.

Figure 6: Age of Finishing Service



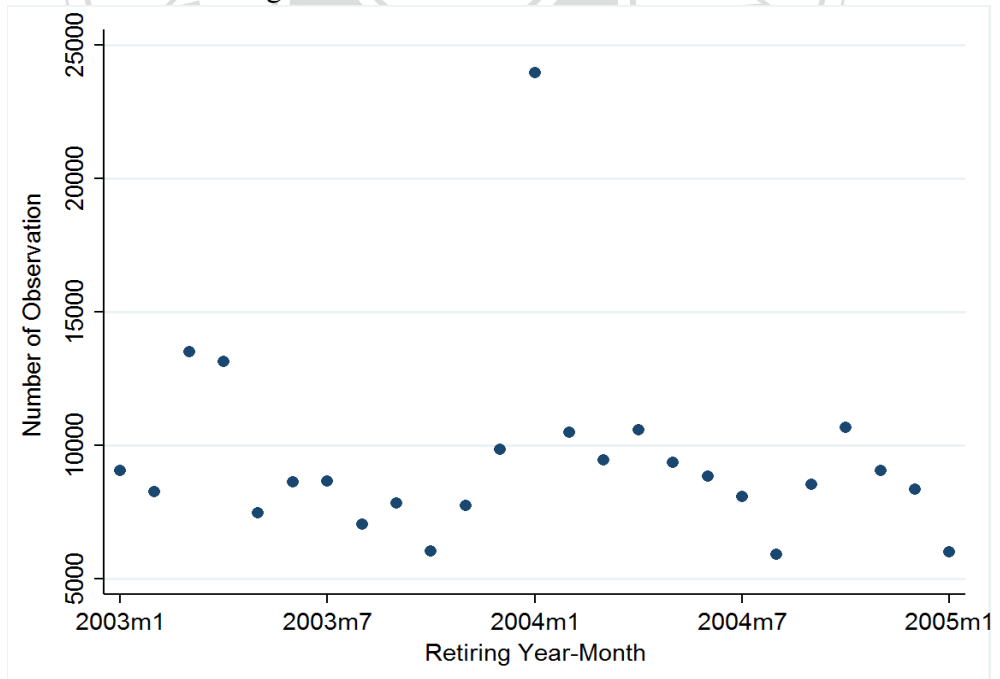
Notes: The average age of servicemen retired after January 2004 is greater than those who finished service before. Therefore, we try to control their age of starting service and plot the residual on their age of finishing service. For the servicemen on the right to the cutoff, their retirement age should be 2 months younger than those on the left as they served two fewer months. In this figure, the average age on the right to the cutoff is 1 to 2 months lower.

Figure 7: Number of Servicemen Retired in 2 Age Groups



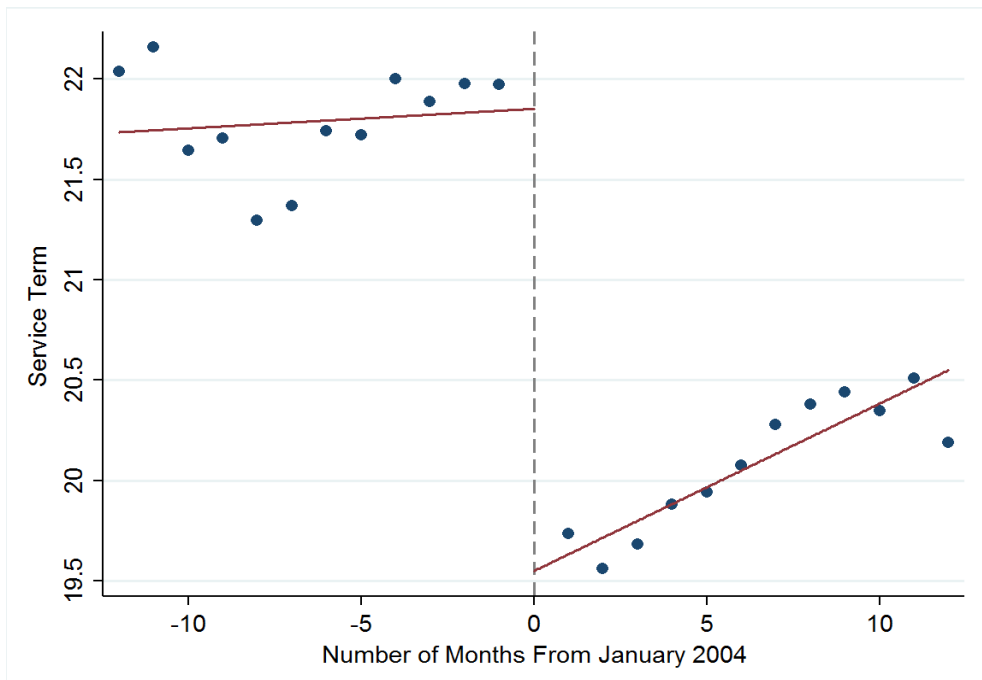
Notes: This figure shows the number of servicemen finished their duty in each month. After January, the number of older servicemen surpassed younger servicemen, which explains the increasing age we found on the right to the cutoff.

Figure 8: Number of Servicemen Retired



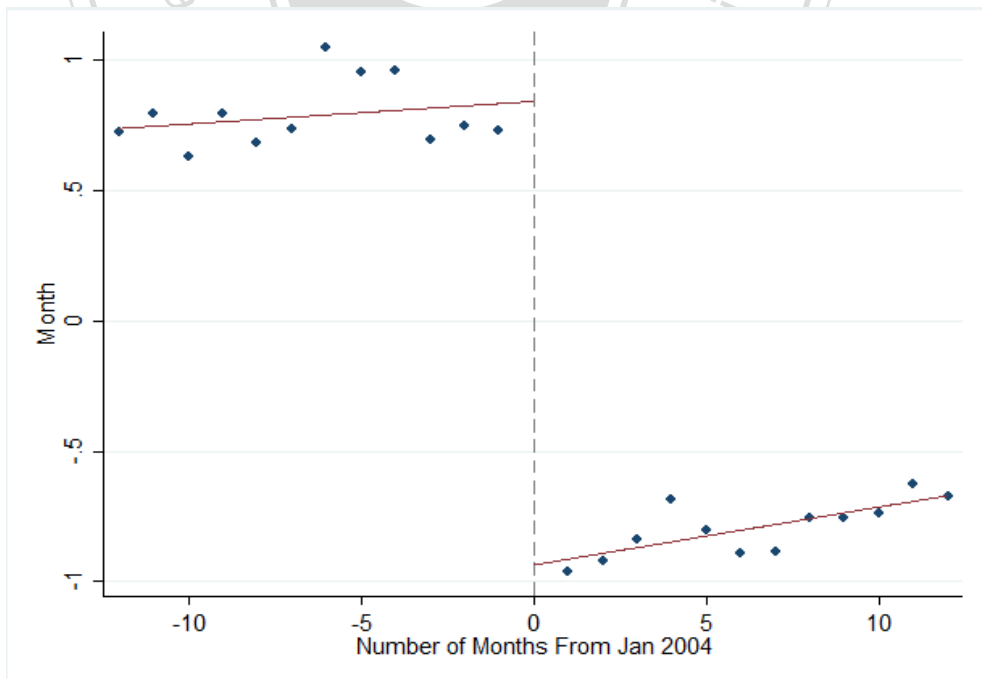
Notes: For servicemen who were supposed to retire on January and February in 2004, they were all released on January 1. And for those who were supposed to retire in March, they also retired in January as well. Therefore, the number of servicemen retired on January is three times as many as it is in other months.

Figure 9: Average Length of Service Term



Notes: This figure shows the average length of service for servicemen retired from January 2003 to January 2005. The average service increased when there's fewer servicemen aged 22 to 25 retired.

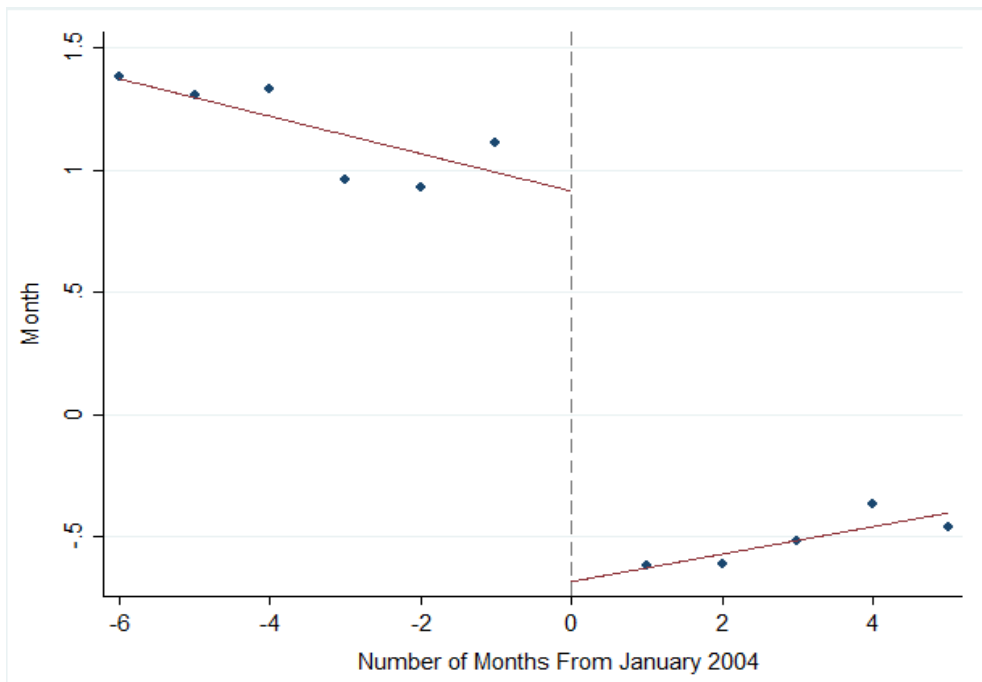
Figure 10: Service Term Controlling Age of Starting Service



Notes: This residual plot shows the influence of different number of older servicemen disappear after controlling their starting age. The average term became smooth and decreased by 1.5 to 2 months for servicemen retired after January 2004.

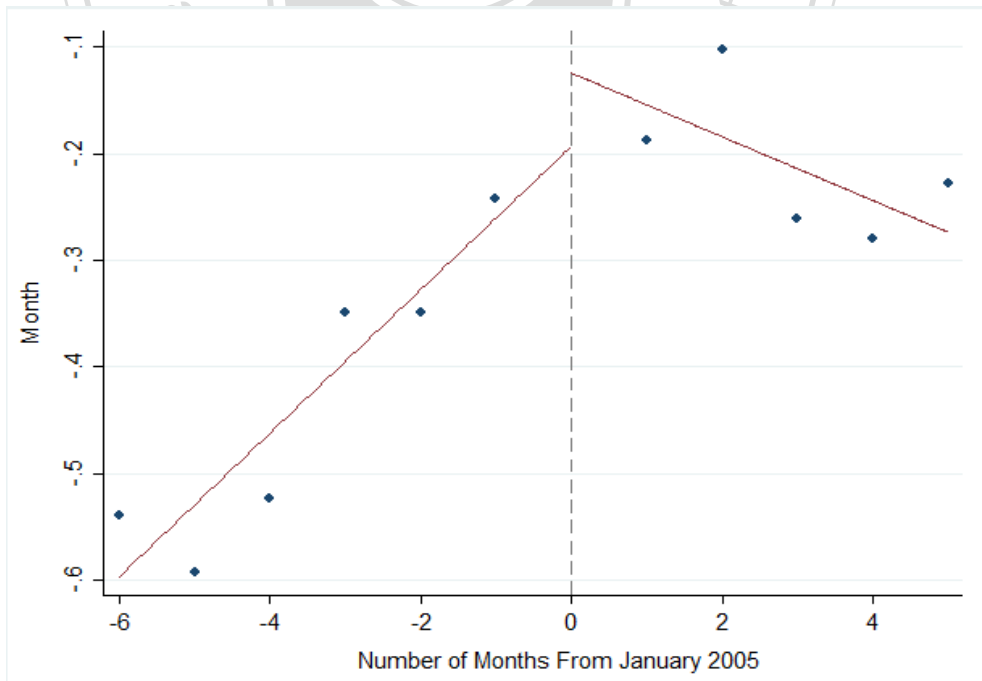


Figure 11: Service Term in 2004's RD



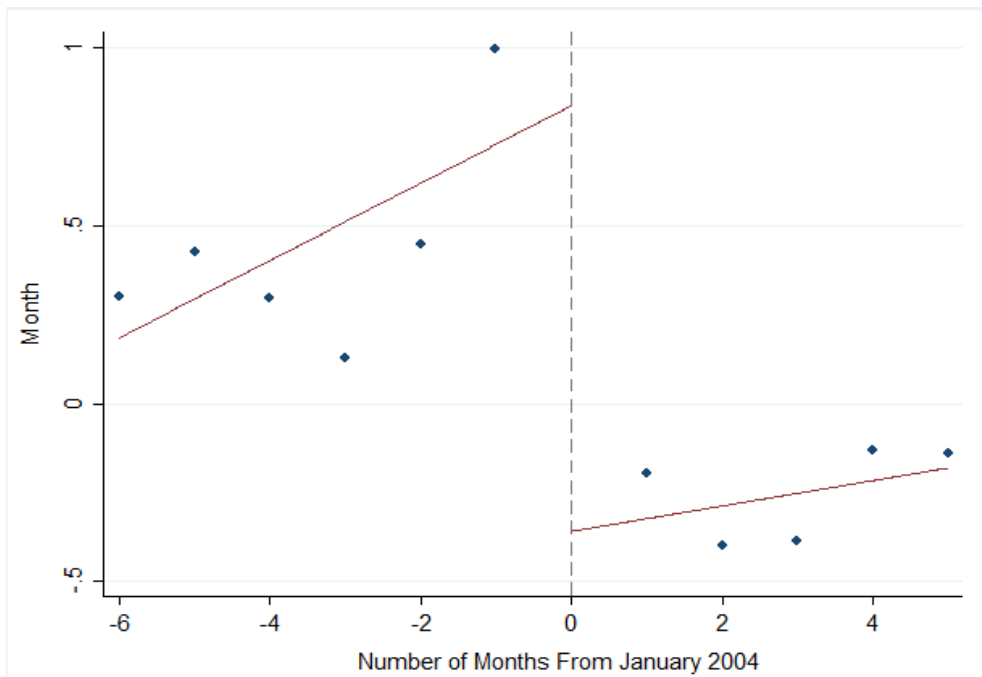
Notes: This residual plot shows the change in service term after controlling starting age. The length of term dropped by 1.5 to 2 months for servicemen retired after January 2004.

Figure 12: Service Term in 2005's RD



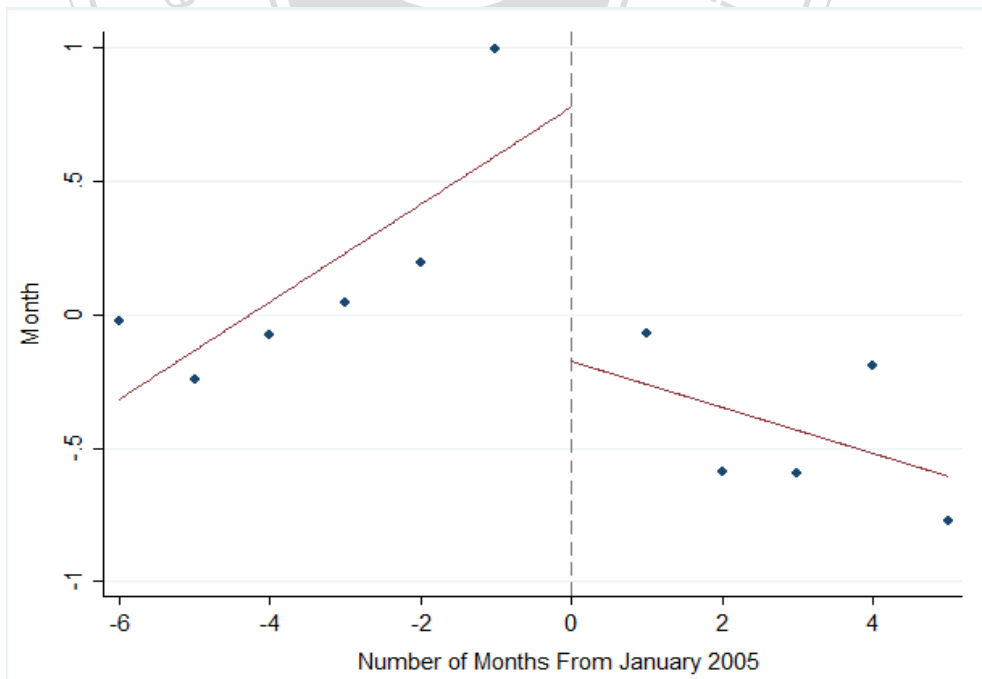
Notes: This residual plot shows the change in service term after controlling starting age. The length of service increased by less than 0.1 months for servicemen retired after January 2005.

Figure 13: Time of Finding a Job in 2004's RD



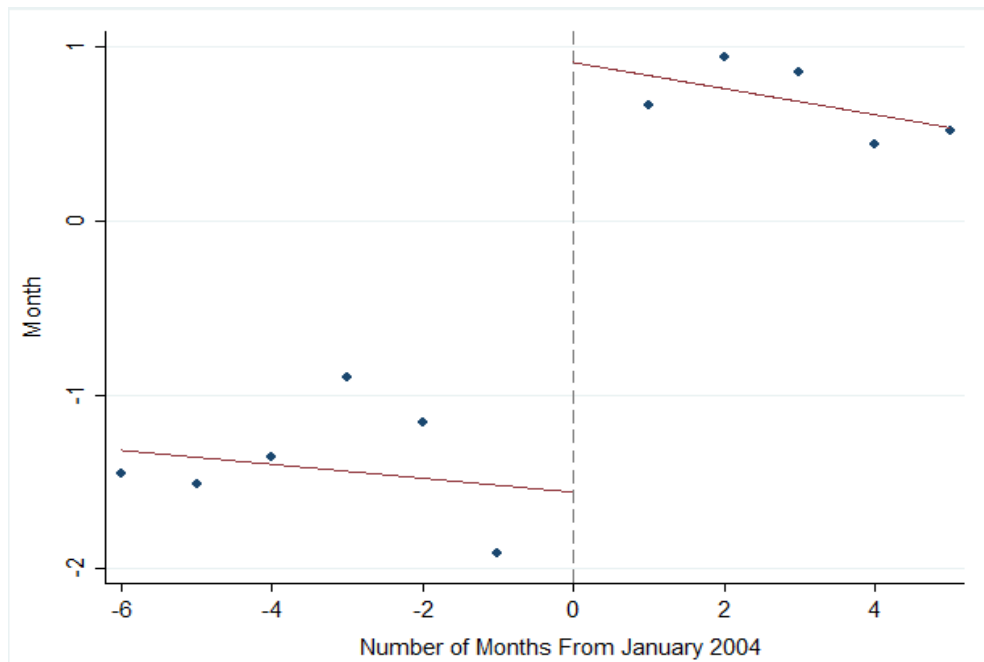
Notes: This residual plot shows the change in time of finding a job after controlling starting age. For servicemen retired after January 2004, servicemen with term deduction found a job 1 to 1.5 months earlier.

Figure 14: Time of Finding a Job in 2005's RD



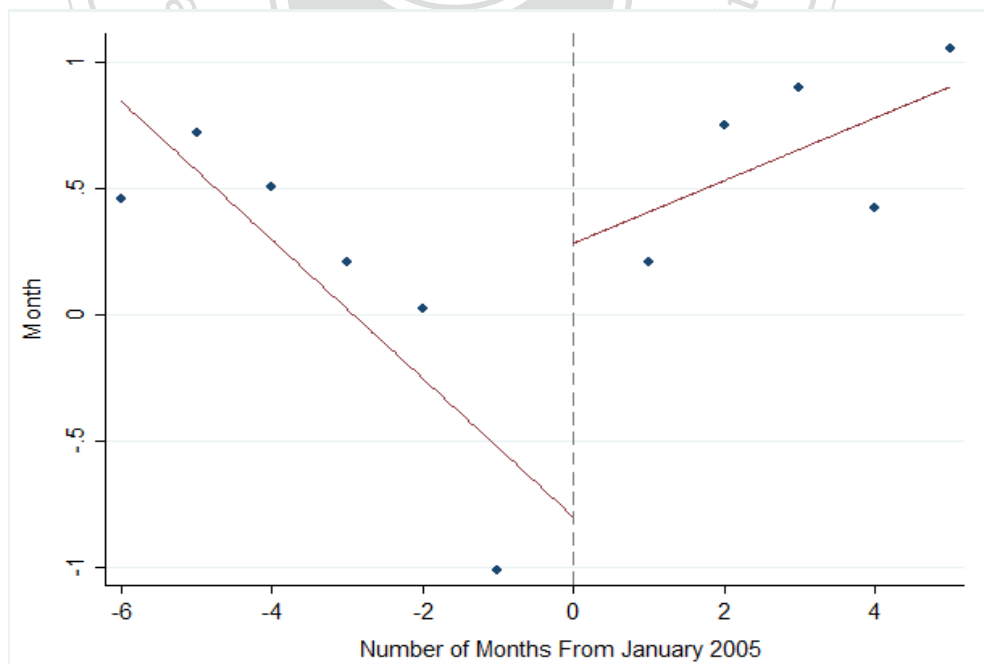
Notes: This residual plot shows the change in time of finding a job after controlling starting age. For servicemen retired after January 2005, servicemen found a job 1 month earlier even there was no deduction policy.

Figure 15: Working Experience in 2004's RD



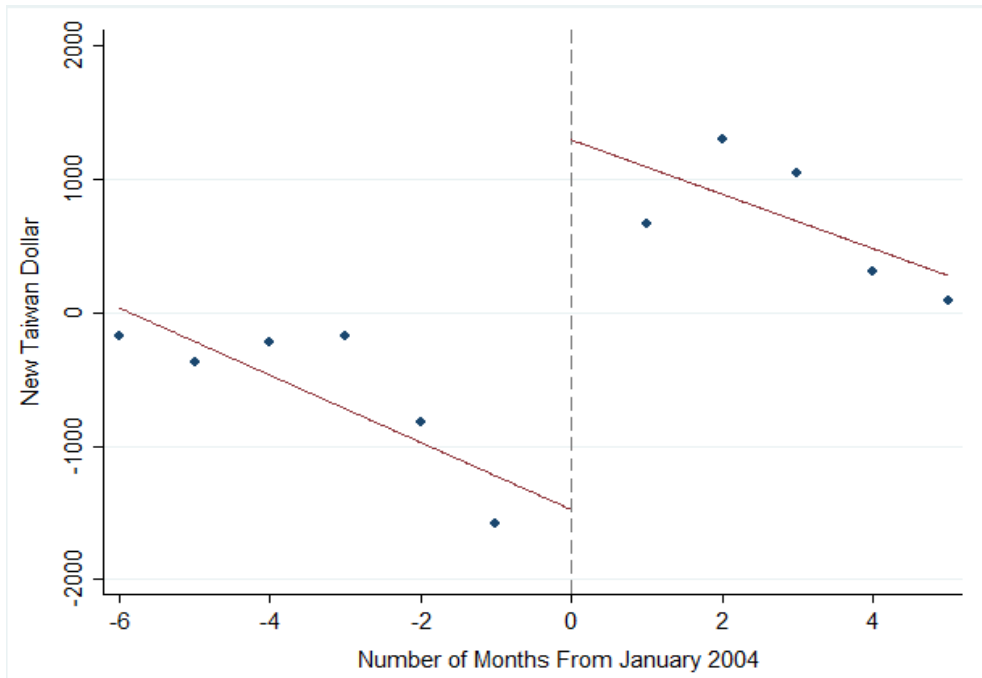
Notes: This residual plot shows the change in working experience accumulated 3 years after starting service, controlling starting age. For servicemen retired after January 2004, they accumulated 2.5 more months of working experience,

Figure 16: Working Experience in 2005's RD



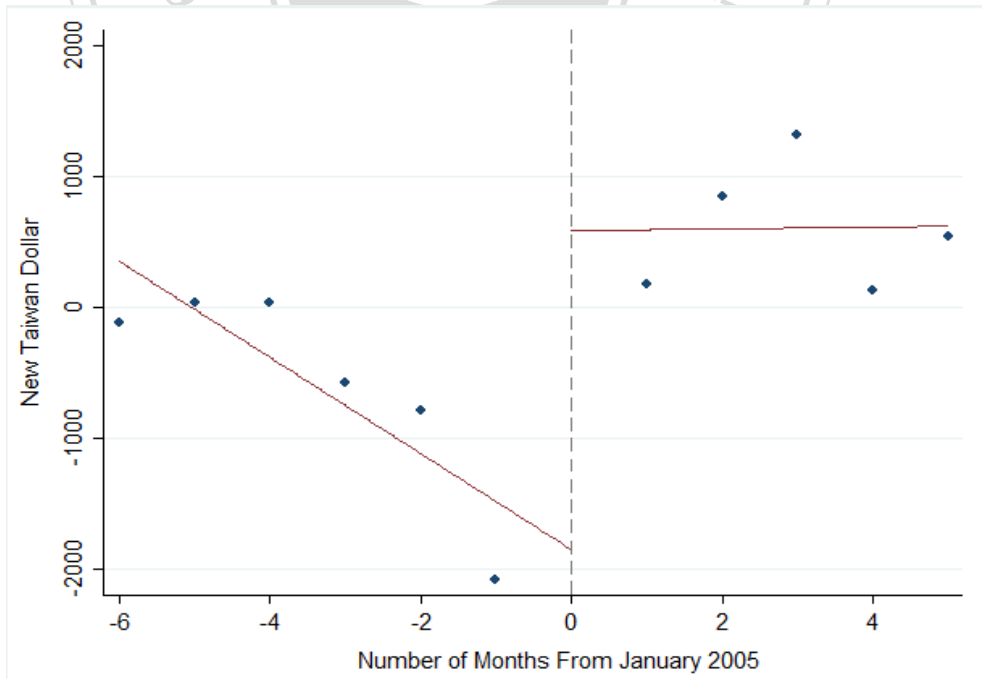
Notes: This residual plot shows the change in working experience accumulated 3 years after starting service, controlling starting age. For servicemen retired after January 2005, they accumulated 1 more month of working experience,

Figure 17: First Monthly Income in 2004's RD



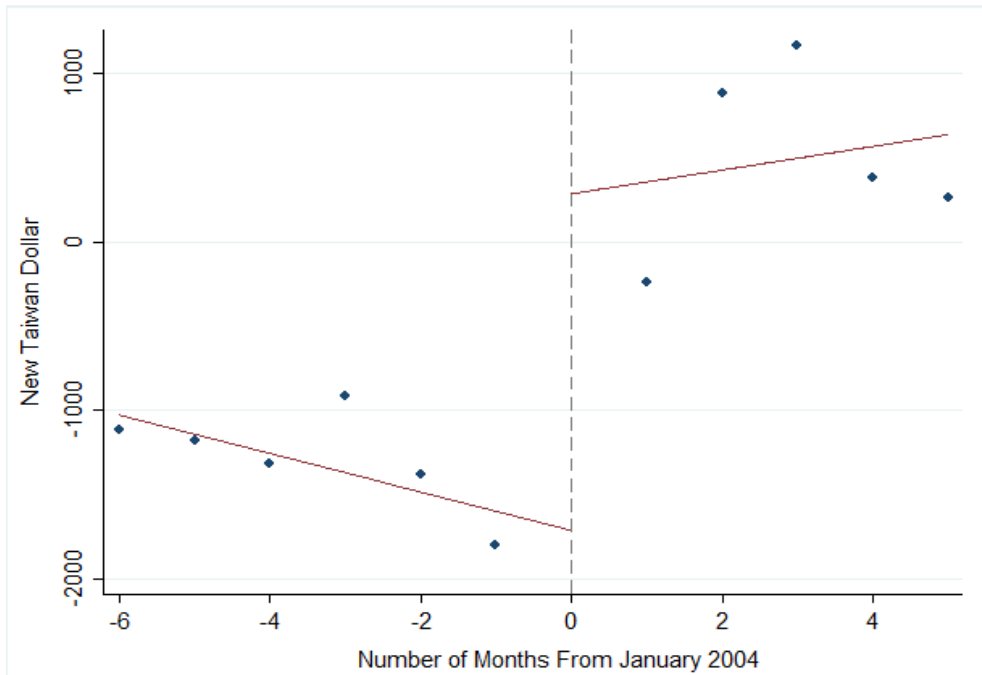
Notes: This residual plot shows the change in first job's income, controlling starting age. For servicemen retired after January 2004, servicemen with term deduction received around NTD 2,500 more on first monthly income.

Figure 18: First Monthly Income in 2005's RD



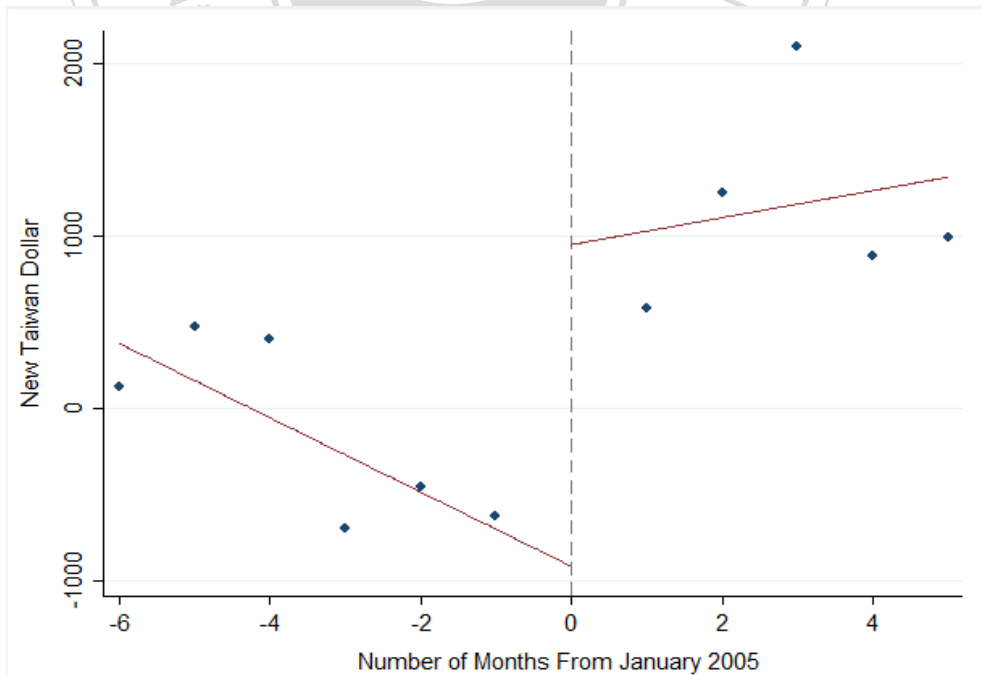
Notes: This residual plot shows the change in first job's income, controlling starting age. For servicemen retired after January 2005, servicemen received around NTD 2,500 more on first monthly income.

Figure 19: Income 3 Years After Starting Service in 2004's RD



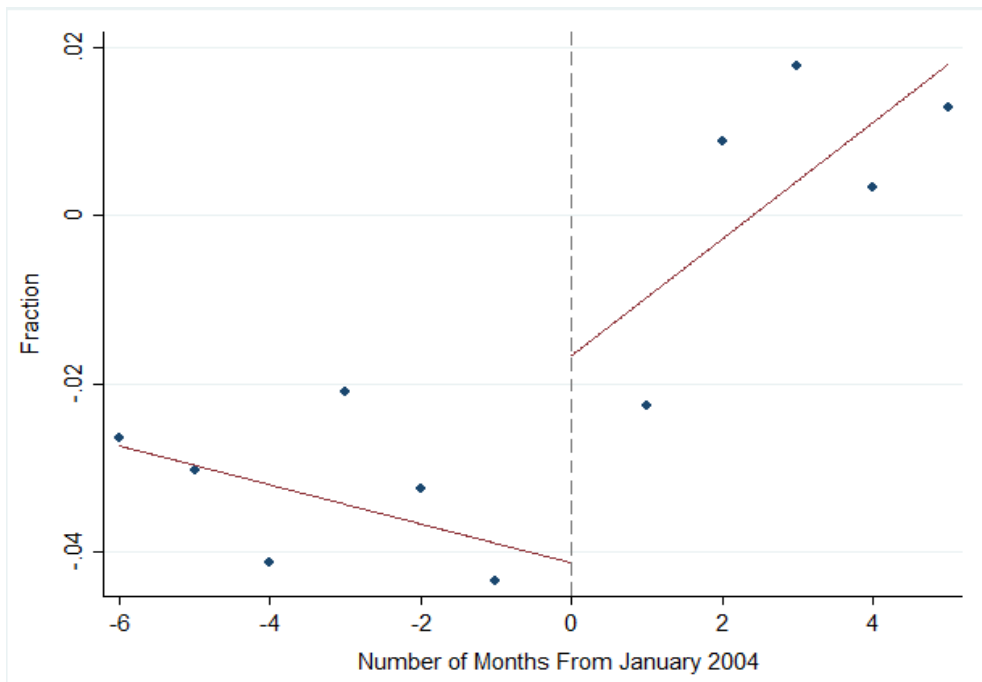
Notes: This residual plot shows the change in income 3 years after starting service, controlling starting age. For servicemen retired after January 2004, servicemen with term deduction received around NTD 2,000 more on monthly income.

Figure 20: Income 3 Years After Starting Service in 2005's RD



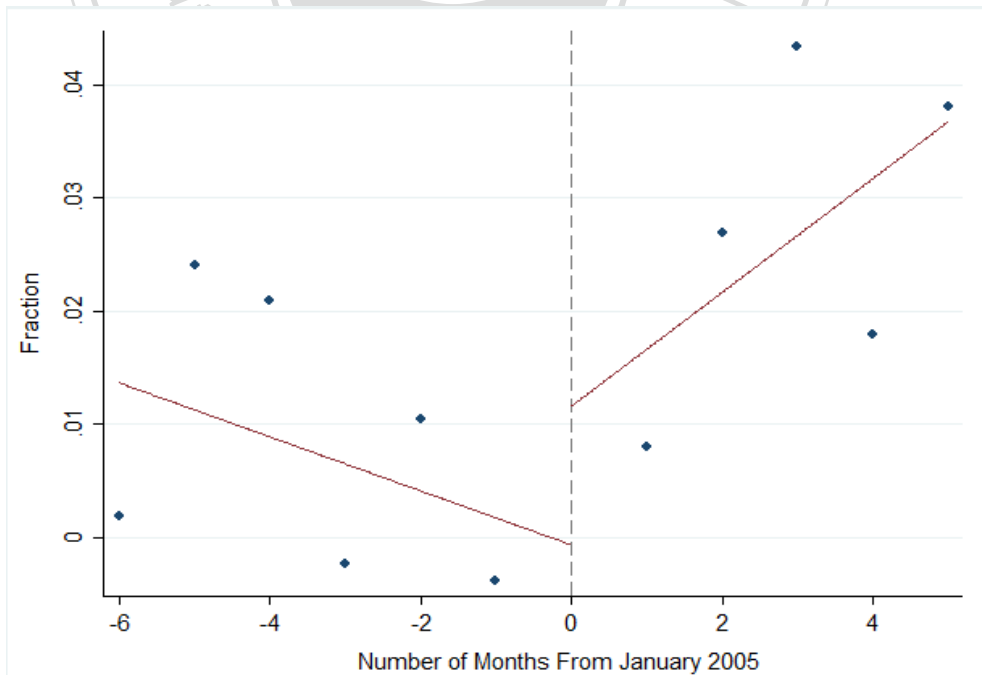
Notes: This residual plot shows the change in income 3 years after starting service, controlling starting age. For servicemen retired after January 2005, servicemen with term deduction received around NTD 1,900 more on monthly income.

Figure 21: Fraction of Having a Job 3 Years After Starting Service in 2004's RD



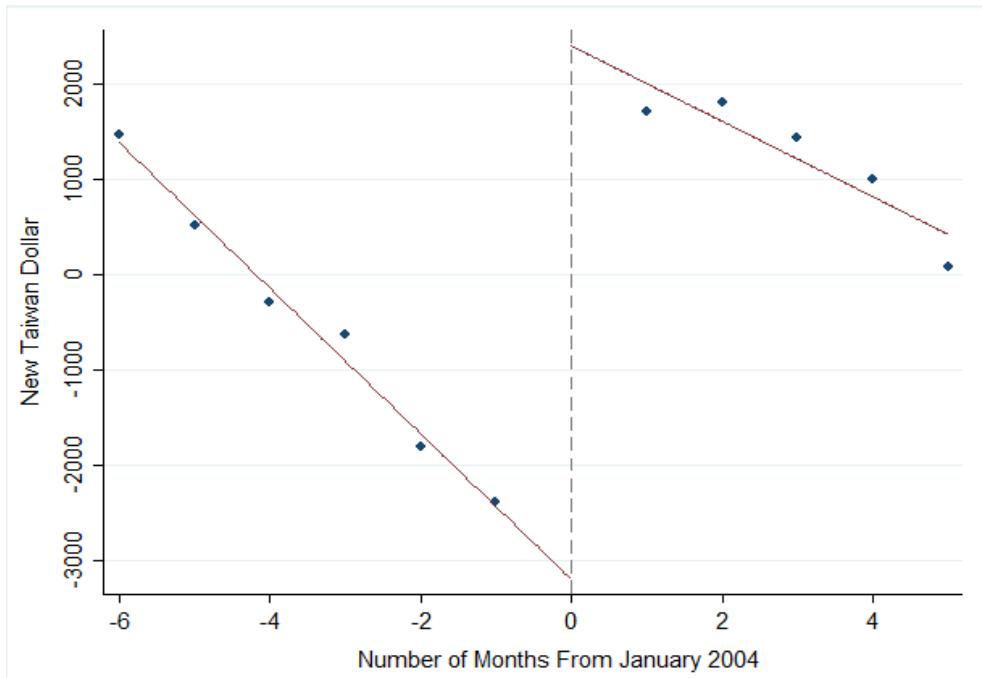
Notes: This residual plot shows the change in the fraction of having a job 3 years after starting service, controlling starting age. For servicemen retired after January 2004, the fraction of having a job increased by 2 percentage points.

Figure 22: Fraction of Having a Job 3 Years After Starting Service in 2005's RD



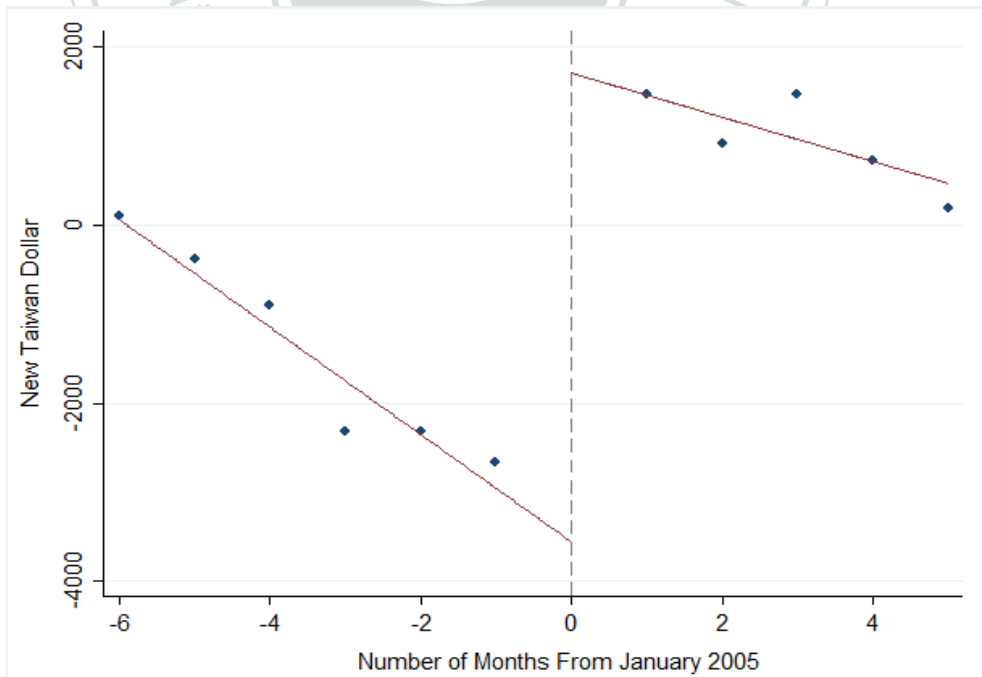
Notes: This residual plot shows the change in the fraction of having a job 3 years after starting service, controlling starting age. For servicemen retired after January 2005, the fraction of having a job increased by 1 percentage point.

Figure 23: Income 10 Years After Starting Service in 2004's RD



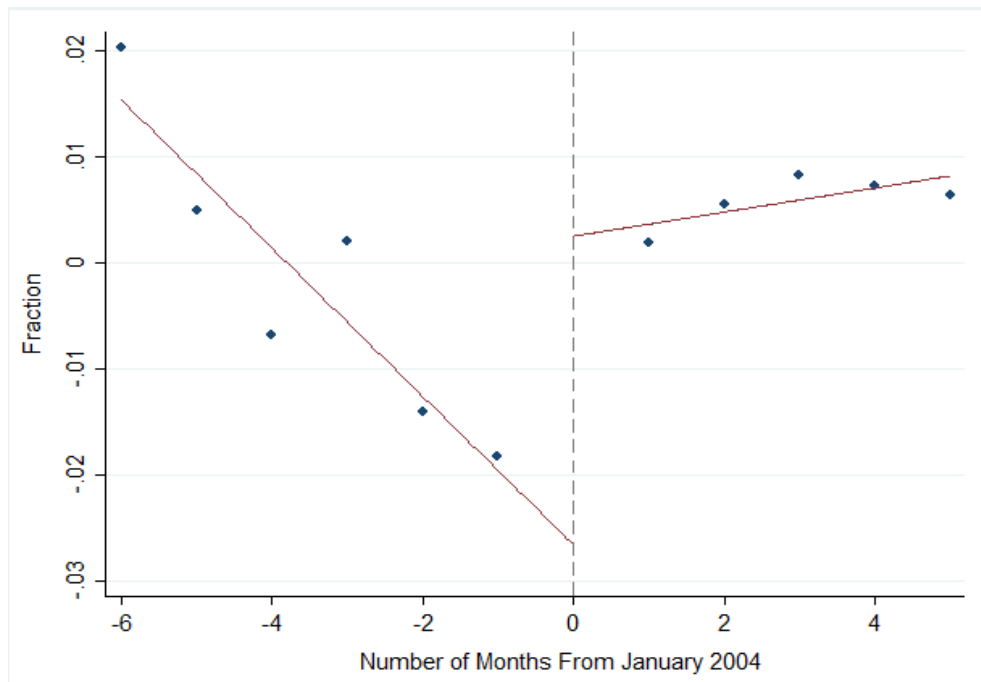
Notes: This residual plot shows the change in income 10 years after starting service, controlling starting age. For servicemen retired after January 2004, servicemen with term deduction received around NTD 5,000 more on monthly income.

Figure 24: Income 10 Years After Starting Service in 2005's RD



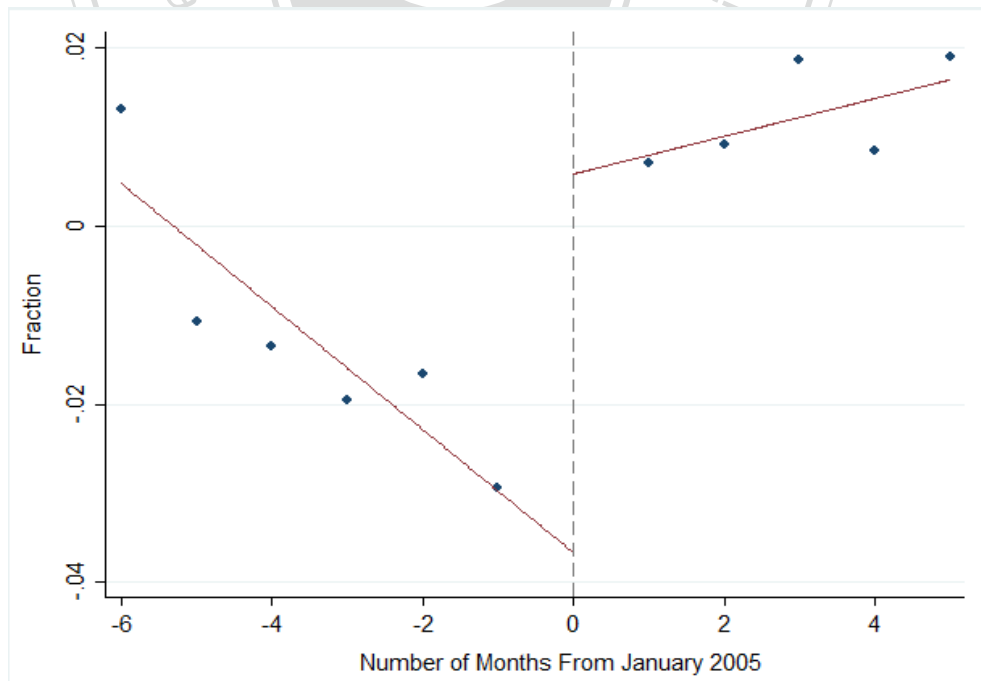
Notes: This residual plot shows the change in income 10 years after starting service, controlling starting age. For servicemen retired after January 2005, servicemen with term deduction received around NTD 5,000 more on monthly income.

Figure 25: Fraction of Having a Job 10 Years After Starting Service in 2004's RD



Notes: This residual plot shows the change in the fraction of having a job 10 years after starting service, controlling starting age. For servicemen retired after January 2004, the fraction of having a job increased by 3 percentage points.

Figure 26: Fraction of Having a Job 10 Years After Starting Service in 2005's RD

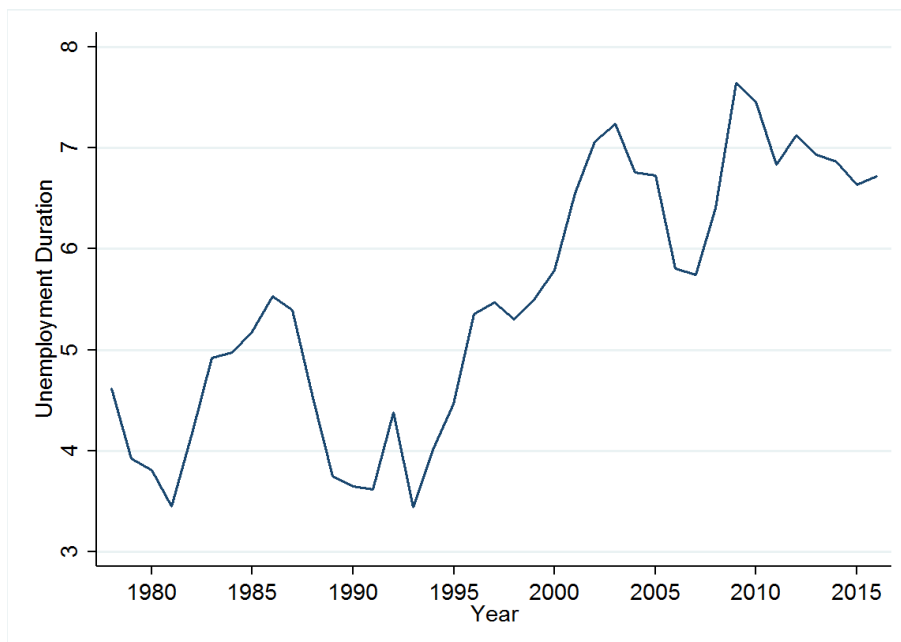


Notes: This residual plot shows the change in the fraction of having a job 10 years after starting service, controlling starting age. For servicemen retired after January 2005, the fraction of having a job increased by 4 percentage points.



## Appendix

Figure 27: Unemployment Duration of First-Time Job Seekers



*Notes:* This figure shows the unemployment duration of first-time job seekers in each year. Around 2005, it took 6 months for job seekers to find their first job. Source: Directorate General of Budget, Accounting and Statistics (DGBAS), R.O.C.

Figure 28: Number of Job Seekers and Vacancies



*Notes:* This figure shows the number of job seekers and vacancies in each year. After January, the number of job vacancies increased tremendously, which explains the seasonal alteration in Taiwan's job market. Source: Ministry of Labor, R.O.C.