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An option embedded novel military service system based on cognitive bias theories

Novel military service system

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Abstract

Purpose – The purpose of this study is to hypothesize that cognitive biases such as nostalgia, rosy retrospection, overconfidence, fading-affect bias and prospect theory affect how to serve in the military. The behaviors of those expecting military service and those who have completed the service differ significantly in evaluating the self and social value of the human capital during the military service. This difference corresponds to the predictions of the cognitive-bias literature. The authors test propositions in option framework. This study's experimental design proposes a novel military system, a hybrid of conscription and voluntary systems. This study's results are consistent with the hypothesis, option theory and behavioral economics literature.

Keywords Cognitive bias, Option, Military service, Conscription, Irrational behavior

Paper type Research paper

1. Introduction

In some countries, it is mandatory but luckydrawed in some other countries. And it requires more than 11 years in a certain country or less than 1 year in many countries. Sometimes it goes to both genders or only to men. Yes, as you might have guessed, it is military service. Up until now, there are lots of studies on how to recruit and retain (Moskos, 1977; Stafford and Griffis, 2008) and how long it should be (Warren, 1962; Kestnbaum, 2000). However, to our knowledge, there is no study on how it is designed from the perspective of the supply side of armed forces resources even given the unavoidable conscription situations such as in the Korean Peninsula.

We fill this gap with option framework approach based on cognitive bias theories, especially for the Korean case. Every qualified man in Korea should go to the military for 21 months. Some think this is another lifetime opportunity for the development of leadership or moderation. But others regard this is just a waste of time or sunk cost. These two extreme

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contrary views on military service also cause problems to military authorities as they should keep the morale of armed forces with sleepyheads who could crowd out other eager hearts.

To solve this dilemma, we hypothesize that cognitive biases such as nostalgia, rosy retrospection, overconfidence, fading-affect bias (FAB) and prospect theory affect those who have completed the service and those expecting military service on how to serve in the military. We test propositions in option framework. First, we define “the post-service” as the people having completed their obligatory military service in the past, and “the pre-service” as those who should serve in the future.

People tend to be overconfident for the future and positively biased for the past. Therefore, we presume that the post-service are likely to recognize the hypothetical extension of military service as reduced gains while the pre-service as increased losses. Consequently, the pre-service require (pay) more financial compensation for the extension (reduction) of military service than the post-service.

And to evaluate the hypothesis, we propose a novel military system that gives conscripted soldiers an option at the end of a certain month to choose from two alternatives: leave the military immediately or serve more months with additional monetary compensation.

2. Literature review

Nostalgia is lost narratives, a longing for the bygone, “a self-relevant emotional reflection on the past” (Routledge *et al.*, 2008) and “the experience of sentimentality” (Vess *et al.*, 2012); people usually have a positive bias for the past. Therefore, the post-service will evaluate their military service more favorably than the pre-service. If a nation calls people to serve in the military for a longer period, the post-service will require less compensation than the pre-service.

Similarly, if people can pay to reduce their military service period, the post-service will set the socially desired price for the reduction lower than the pre-service do. The predictions of rosy retrospection (Mitchell and Thompson, 1994; Mitchell *et al.*, 1997) and FAB for negative event memories (Walker *et al.*, 2003; Walker and Skowronski, 2009) should be similar to nostalgia.

Otherwise, overconfidence works in the mind of the pre-service more than that of the post-service. Overconfidence leads people to presume their human capital overly valuable. Serving in the military means the loss of the opportunity to run human capital in the civil sector. Both the post-service and the pre-service are subject to overconfidence, but the extent differs. The post-service already knows their realized human capital in the military and the paid opportunity cost of human capital in the civil sector, but the pre-service do not.

Hence, the pre-service are more subject to overconfidence, and so more value their human capital, and therefore will require higher financial compensation for the military service than the post-service. Similarly, if people can pay to reduce their military service, the desired price for the reduction will be lower for the post-service than the pre-service. The pre-service will over-pay for the reduction because of overconfidence in their human capital.

Prospect theory (Kahneman and Tversky, 1979) makes a similar prediction. When evaluating the gains/losses of military service, the pre- and the post-service use different reference points: memory of the military (the post-service) vs the current civil situation (the pre-service). Then, the post-service will perceive the *hypothetical decrease* in the duration of obligatory military service as “gains” (at least not “losses” because the past is in the past), while the pre-service as reduced “losses.” The losses loom larger than the gains.

Thus, the pre-service will pay more for the decrease than the post-service. To state it differently, to the post-service, their completed military service is a gain, liberated from the military and not re-doing the obligatory, hard and painful military service. Thus, the

“escape” from the military service is a gain. However, military service is always a loss to the pre-service.

3. Hypothesis and data

The aforementioned intuitions yield next hypothesis about the civil duty for the military service:

H1. The post-service will desire lower social compensation on the others’ extended service than the pre-service will.

We test the hypothesis for the Korean case considering its unique geopolitical context. Every healthy Korean male *should* serve in the military for 21 months. As vacation accounts for about one month, they serve around 20 months. A soldier passes through four ranks during 20 months. Each lasts around five months. From lowest to highest, the ranks are private second class (*ibyeong* in Korean), private first class (*ilbyeong*), corporal (*sangbyeong*) and sergeant (*byeongjang*).

In this system, we introduce a novel hybrid of conscription and voluntary system as follows:

- every healthy male should serve 10 months as a private (second and first class); and
- at the end of the 10th month (“*option maturity*”), the government gives privates an option to choose from two alternatives. A1: “*exercising call option* [1]” – leave the military immediately. A2: “*exercising put option*” – receive KRW 20m [2] and serve in the military 10 months more as corporal and sergeant if the military approves it.

Our proposition can be viewed as a hybrid option whose payoff is:

$$\begin{aligned} \text{Max}(NPV_d, NPV_c) &= \text{Max}(NPV_d - NPV_c, 0) + NPV_c \\ &= \text{Call option with a strike price of } NPV_c \\ &\quad + \text{Bond with a face value of } NPV_c \end{aligned}$$

where NPV_c is the NPV of all future cash flows when continuing, NPV_d and NPV is the of all future cash flows when discharging. Choosing “continue” is just delaying the NPV_d that would otherwise be received. Therefore, NPV_m letting be the NPV of 10 month military service (= KRW 20m – labor inputs during the period) and R be the risk-adjusted discount rate for the period, the NPV_c is:

$$PV_C = NPV_m + \frac{NPV_d}{(1 + R)}$$

This setting suggests a proposition that:

$$(NPV_d - NPV_c) > 0 \text{ if and only if } (NPV_d / NPV_m) > (1 + R) / R$$

For example, if the discount rate is 20%, the investor will choose to “discharge” (or exercise) if the NPV of his cash flows of a lifetime (i.e. NPV) exceeds six times the NPV of the additional 10 month service (NPV_m). Note that NPV_m is proportional to the “socially desired strike price” that the authors defined. Thus, this problem boils down to comparing NPV_d with NPV_m .

We examine the responses of 300 randomly selected young, educated Korean males (21–31 years old) on this hybrid system. They are either college students or college

graduates. We match the regional distribution of the random sample with that of the Korean population. Half is the pre-service and the other half is the post-service.

We also examine social valuation on the monthly strike price. It assesses how much our hybrid system is socially implementable. The larger the number, the higher the society praises the sacrifice in the military, but the more costly to implement the hybrid.

This hypothesis considers the classic debate on voluntary vs conscript army. The next section explains our empirical design suggesting a novel military system, a possible solution to the debate (Altman and Barro, 1971; Kilburn and Klerman, 1999; Asch *et al.*, 2007).

4. Empirical results

Table 1 shows that about 60% of the pre-service and 70% of the post-service respondents are willing to choose “continue” out respectively. Thus, the post-service is more likely to accept the put option (reject call option). This result suggests the validity of the hypothesis (albeit self, not social assessment).

Table 2 details Table 1 [3]. It clarifies how individuals value the embedded real option considering their human capital. We code “discharge” as 1 and “continue” as 0 for a dependent variable. “Discharge” means that a respondent chooses (A1). “Continue” indicates the choice of (A2).

As we expect, we have different results by group. For the pre-service, the older a male, the more often he chooses to continue. If a respondent has a college degree, he is more likely to choose *discharge*. If he lives in Seoul, he is more likely to choose *continue*. The more the parents’ wealth, the more he chooses to be discharged. College majors are significant.

Our interpretation of the results is as follows. First, in the mind of the pre-service, the longer the working periods by getting a job 10 months earlier, the higher his return from human capital investment. Thus, the longer the remaining working period, the higher the call option value or the incentive for discharge. Therefore, the younger he is, the more he

Variable	The pre-service (military service expected)	The post-service (military service finished)
Option exercise (choosing discharge over KRW 20m)	0.391 (0.490)	0.307 (0.463)
Age	20.09 (1.357)	26.33 (2.703)
Subjective socially accepted strike price (KRW thousand) (choosing discharge over strike price)	2,276 (2,091)	1,792 (1,233)
College graduate	0.0301 (0.171)	0.533 (0.501)
Parent’s net asset (KRW thousand)	136,470 (127,750)	185,170 (159,460)
Seoul city residents	0.248 (0.434)	0.293 (0.457)
Literature major in college	0.0752 (0.265)	0.0733 (0.262)
Social science major	0.0827 (0.276)	0.107 (0.310)
Business economics major	0.105 (0.308)	0.180 (0.385)
Natural science major	0.0902 (0.288)	0.0533 (0.225)
Engineering major	0.511 (0.502)	0.493 (0.502)
Observations	133	150

Notes: Option exercise = 1 for “discharge” and 0 for “continue and receive ₩20 million.” As for subjective socially accepted strike price, we ask what a respondent thinks is a *socially desirable strike price*, the amount of staying in the military (“continue”) per month. For example, if a respondent answers ₩2m, he believes that a soldier should receive it per month if the soldier chooses to serve for the military 10 months more as a corporal and sergeant. Standard deviations in parentheses

Table 1.
Summary statistics

Table 2.

Probit estimation results for option exercise (unit: KRW 10,000)

Variable	The pre-service (military service expected)	The post-service (military service finished)
Age	-0.291*** (0.104)	-0.0230 (0.0461)
College graduate	1.544** (0.689)	0.199 (0.258)
Parent's net asset (KRW thousand)	0.00188* (0.00102)	0.0153** (0.000693)
Seoul city residents	-0.518* (0.282)	0.0833 (0.242)
Literature major in college	-0.764 (0.569)	-0.915 (0.580)
Social science major	0.252 (0.523)	-0.267 (0.455)
Business economics major	-0.700 (0.511)	-1.190** (0.470)
Natural science major	-0.173 (0.340)	-0.578 (0.370)
Engineering major	5.540*** (2.058)	0.269 (1.261)
Observations	133	150
Log pseudo likelihood	-78.920813	-85.678038

Notes: We code "discharge" as 1 and "continue" as 0 for a dependent variable. Robust standard errors are in parentheses. *** $p < 0.01$; ** $p < 0.05$; * $p < 0.1$

prefers discharge. This is similar to the overconfidence story. In the mind of overconfident people, this relationship between age and human capital valuation should be strong. Then, the post-service should less show these behaviors. Indeed, for the post-service, age is insignificant.

Second, as college graduates are ready to enter the labor market, they tend to value the call option higher. Alternatively, college graduates worry more about their human-capital depreciation after the extended 10-month service than college students do, because the former lack the opportunity to resume schooling and catch up with competitors after discharge. Overconfident or loss-averse people will show this pattern in a more salient way. Then, the analysis on the post-service should less show this pattern. Indeed, for the post-service, the college graduate dummy variable is insignificant, consistent with the overconfidence and prospect theory literature.

Third, Seoul residents are more likely to be pessimistic in getting a job because of high competition among labor supplies in the city. Hence, conditional on other characteristics, they value the call option less and so are more likely to accept the put option. The post-service should not show this pattern. The post-service are subject to nostalgia, rosy-retrospection and FAB. Those cognitive biases are independent of where the post-service live. Thus, the Seoul dummy should not affect their valuation on the options, which the results support.

On the other hand, the pre-service are more likely to be subject to overconfidence because they have less information on the military service. This overconfidence should be sensitive to the job market situation in the civil sector. Thus, the Seoul dummy should affect the valuation on the option, which the results support.

We can explain this pattern using prospect theory too. The increment in service period is increased loss to the former, while reduced gain to the latter. The perceived amount of loss and gain is a function of the observed job-market competition. Thus, the pre-service should be more sensitive to the job market situation (residence dummy) than the post-service, as our results show.

Fourth, if an individual has rich parents, he is likely to be optimistic about his job market prospects because his family background works as insurance increasing the call option value (decreasing the put option value of the hybrid system). Interestingly, the coefficient for

the post-service is more significant. For the pre-service, the coefficient is significant at 10%, but for the post-service, it is significant at 5%. This result corresponds to overconfidence story. The pre-service overconfidently underestimate the insurance value of parental wealth. Other results for the pre- and the post-service are similar and consistent with the literature.

Next, to test the hypothesis, we ask what a respondent thinks is a socially desirable *strike price*, the amount of staying in the military (“continue”) per month. For example, if a respondent answers KRW 2m, he believes that a soldier should receive it per month if the soldier chooses to serve for the military 10 months more as a corporal or sergeant [4].

Table 3 supports the hypothesis: the post-service regards the desired strike price KRW 618,400 less. The mean of socially accepted monthly option *strike price* is KRW 2,049,047 per month. It is purely a coincidence that this amount matches the number appearing in our first survey. Our best guess is that Korean men in their 20’s regard the time in the military as foregone labor income.

The other results correspond to those in Table 2. The only difference is the result for literature majors, revealing one aspect of the Korean labor market. These days, college graduates with a literature major experience extreme hardship in the job market. The value of the call option in hand tends to decrease if one has poor outside options, to which our results correspond.

5. Conclusion

How will cognitive biases affect the decision on military service? Existing literature such as Hansen and Weisbrod (1967) offers opinions but has ignored a fundamental variable, *the human mind*. We fill this gap by suggesting a novel military service system in Korea, which is giving a call option to prospective soldiers and a put option to military authorities.

We examine the responses of 300 randomly selected males on this hybrid system. We have different results by group. For the pre-service, the older a male, the more often he chooses to continue. If a respondent has a college degree, he is more likely to choose *discharge*. If he lives in Seoul, he is more likely to choose *continue*. The more the parents’ wealth, the more he chooses to be discharged.

Our results that the post-service regard the desired strike price less valuable are intuitive and consistent with the hypothesis, option theory and behavioral economics literature.

Variable	Subjective socially accepted <i>strike price</i> (KRW thousand)
Age	0.654 (4.386)
The post-service (military service finished)	-61.84** (29.54)
College graduate	18.40 (31.57)
Parent’s net asset (KRW thousand)	0.130* (0.0707)
Seoul city residents	-36.50** (17.87)
Literature major in college	-65.52** (31.86)
Social science major	41.18 (39.26)
Business economics major	-52.73** (25.83)
Natural science major	46.57 (55.39)
Engineering major	-19.04 (23.30)
Constant	217.5** (94.47)
Observations	298
R-squared	0.081

Table 3.
Subjective socially
accepted strike price
ordinary least
squares estimation
result

Notes: Robust standard errors are in parentheses. *** $p < 0.01$; ** $p < 0.05$; * $p < 0.1$. Mean of socially accepted monthly option strike price is KRW 2,049,047 per month

Army ranks from lowest	Insignia	Description
Private second class (<i>ibyeong</i>)		A healthy Korean male must serve ten months as a private
Private first class (<i>ilbyeong</i>),		
Option Maturity: A private should decide between discharge vs. continue		Decide whether to be discharged immediately or to receive 20 million KRW (or other amounts depending on the survey questions) and continue to the service ten months more
corporal (<i>sangbyeong</i>)		Serve only if a person chooses "continue" option and if the military approves him
Sergeant (<i>byeongjang</i>)		

Figure 1.
Description of our hybrid military system

Note: The duration of each rank is five months

Furthermore, our empirical design demonstrates how to apply option framework and behavioral economics to propose an innovative military system, a hybrid of conscription and voluntary systems.

However, we admit the questions are addressed from the supply side and the demand side perspective of military authorities is not fully accounted for in terms of how to retain the talented or how to set the strike price. We will discuss these topics in successive studies.

Notes

1. From the soldiers' perspective, A1 ("discharge") is exercising a call option (discarding the put option) in which underlying asset is the human capital in the civil sector; similarly, A2 ("continue") is exercising a put option (discarding the call option).
2. As of 2020, the average yearly wage of Korean men in their 20s surveyed by the government is around KRW 23m on which we set the strike price.
3. We drop 15 males exempted from military service. We drop two more whose parents passed away.
4. This strike price is not desirable for military authorities, but given our goal of keeping the talented in armed forces, the supply side perspective is one of the most important factors.

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