

**ESTIMATION OF THE COST OF ADOPTING THE VOLUNTARY MILITARY
SERVICE IN SOUTH KOREA**

By

Lee, Jung Hyoun

THESIS

Submitted to
KDI School of Public Policy and Management
In partial fulfillment of the requirements
for the degree of

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Committee in charge:

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ABSTRACT

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By

Lee, Jung Hyoun

So far, there have been many studies associated with the military service system. Most of those studies focused on the United States Military and its experience shifting from a draft system to a voluntary system. There has also been a few studies regarding the military service system in South Korea, but most of those studies were not an analysis of the cost of adopting a voluntary system but were arguments about the cost of a draft system and possible directions for improvement. Also, preceding studies have only dealt with the allocative cost, which is the social cost generated in the process of random selection of draftees, under the selective draft system implemented in the U.S. However, there are some limits to applying the U.S. case to South Korea because South Korea has implemented the all-draft system, not the selective draft system. Thus, this paper introduces the concept of deadweight loss, which is the social costs caused by misallocation of labor resources between the military sector and the civilian sectors and estimates the cost of switching to the voluntary system in South Korea. The finding shows that the financial cost of voluntary system would be around 7,020 billion won if the Army keeps the current force strength of 450,000 with 36 month military service per draftee. For the estimation, I used the baseline projection in the *Military Reform 2020* as the demand for the military manpower and the cumulative distribution of draft-eligible men by each civilian pay level as the available supply of military manpower.

Also, this study examines the prospects of the transition from the current draft system to a voluntary system. Because the projected financial cost exceeds the present Army personnel budget of 5,700 billion won, it seems impractical to implement the voluntary system all at once. However, given the enormous economic cost associated with the current draft system, it may be well worth for the South Korean government and the Ministry of National Defense to prepare for the transition to a voluntary system.

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1. Introduction

1.1. Purpose of Study

The ability to defend one's sovereignty is essential to the existence of a nation. No matter how prosperous a country is economically, it will always be exposed to constant external threats if it does not have a strong defensive force. History teaches us that countries with weak defensive forces invariably succumbed to external threats and invasions. Therefore, all over the world, countries are making constant efforts to build up optimal defensive forces for themselves, while taking into account various factors such as their economic power, external threats, past war experiences and so on.

National defense power consists of labor resources and capital equipment. Labor resources mean military manpower, which can conveniently be divided into three categories: (1) Commissioned officers on active duty, (2) Non-commissioned officers on active duty, and (3) Soldiers on active duty. Capital equipment is composed of factors such as weapons, military installations, land, and so forth. Generally, capital equipment is procured at market price. Of course, a part of capital equipment can be requisitioned by the compulsion, but it is difficult to requisition the capital equipment except during wartime because of compensation issues in peace. Military manpower can also be acquired from the civilian sector, but the methods of acquisition of manpower are fundamentally different from that of capital equipment. Acquisition of military personnel can be divided into two categories: one is to acquire military personnel by imposing military duty by the military service law; the other is to fill military personnel requirements with volunteers. The former category is called the "draft system" and the latter is called the "voluntary system."

As stipulated in Article 39 of the constitution of the Republic of Korea, “All citizens have the duty of national defense under the conditions as prescribed by law.” As a result, South Korea adopted the draft system. And the constitution also states, “Nobody must be disadvantaged from performance of their military duty.” The constitution regards personnel on reservist duty who perform military service in other sectors except for the armed forces as personnel who discharge their military service obligation. Namely, South Korea has the all-draft system¹ among the draft systems. At this point, the military service system of South Korea is different from the military service system of the U.S. which has the selective draft system (what we call, Military Selective Service) in the 1960s. The U.S. satisfied military manpower requirements with volunteers at first, and then conscripted the rest of the requirements with the draft system.

South Korea has maintained the all-draft system for sixty years since the “Draft Law” was enacted in May of 1951. Of course, arguments for and against the draft system has been continuing for just as long. Supporters for the draft system have taken the position that the implementation of the draft system as a mean to procure military manpower has been inevitable under the present quasi-state of war as the face-off between North and South Korea continues, and that the all-draft system played a positive role in the improvement of the technological skills of the civilian sector until 1970. On the other hand, opponents of the draft system insist that a draft system hampers economic development by conscripting personnel into the military when otherwise their capabilities and potentials could have been put to better use. In fact, out of current military personnel in active service, college and university graduates make up to 80 percent of military personnel. So, opponents of the draft system emphasize that the government should abolish the draft system and switch to a voluntary

¹ So-called “Universal Military Service System”

system. Also, some of the social issues such as draft dodging, suicide during military service, and conscientious objection to mandatory military service offer them good excuses as to why the government should seriously examine a transition to the voluntary system.

However, we find that many countries in the world still have the draft system as their manpower procurement system. In spite of the many inherent problems in the draft system, many countries still keep the draft system due to its advantages. Consequently, we need to study various aspects of both the draft and voluntary systems in more detail.

In this paper, the theoretical background of the draft and voluntary systems will be examined and attempts will be made to estimate how much cost will be incurred if the present draft system is converted to a voluntary system. For this purpose, the U.S., which moved from the draft into a voluntary system in 1973, will serve as a good example. Especially the transition from the draft to the voluntary system will be very similar to what the U.S. has done, even though the U.S. didn't have the all-draft system like South Korea.

1.2. Scope of Research and Methodologies

The plan of the paper is as follows: in Chapter 2, I will take a closer look at theoretical background of the draft and voluntary system in relation to the social cost, the equity of tax burden, and other issues. In Chapter 3, I will estimate the financial cost and economic cost South Korea has been forced to incur due to the all-draft system, and in Chapter 4, I will estimate the financial cost and economic cost if South Korea replaces the present draft system with a voluntary system, and will analyze the outcome by examining the supply and demand for military manpower. Finally, I will examine the prospects of replacing the current draft system with voluntary system based on the estimation made in Chapter 4.

This paper has limited scope. First, the Army is the only subject of study when we estimate the cost of the voluntary system because the Army accounts for more of the total combined armed forces than the Air force and Navy in terms of the number of men, and because the Army will be most affected by the introduction of the voluntary system. Secondly, we will assume the force strengths (demand of military manpower) are taken to be exogenous. Namely, the purpose of this paper is to estimate cost depending on the given demand for military personnel from the Army, not to compute the optimal force strengths. Third, the object of analysis is only limited to soldiers, not commissioned officers or noncommissioned officers. We will assume that commissioned officers and noncommissioned officers are volunteers. Lastly, “men eligible for the draft” are those who qualify under current physical fitness, moral, and mental standards for military service regardless of their level of education. In other word, as long as they passed the basic requirements, it would not make any difference in their ability to accomplish their missions even if all the new draftees graduated only from high school.

All materials in estimating cost are from 2006 and the most recent data were used in instances where there weren't current data available.

2. The Theoretical Background of the Draft and Voluntary system

Opinions about a draft and voluntary system vary depending on the era and the respective country in question. There are many opinions related to the pros and cons of the draft and voluntary system, but many previous studies agree that the draft system induces additional social costs as compared with a voluntary system. Also, it is recognized that the draft system induces the problem of equity of tax burden by imposing an implicit tax on draftees, collected

in the form of direct labor services. There are, however, some issues which have not been properly dealt with in earlier studies in recognizing the social costs of a draft system, so I will introduce that concept, and reexamine the issues from a different perspective.

2.1. The Social Cost

2.1.1. Allocative Cost

So far, many studies have focused on the theoretical background of how much more cost the draft system would entail than the voluntary system. With regard to the social cost associated with the draft system, there are two well-known studies; “The economics cost of the draft” by Walter Y. Oi, and “Economics of the military draft” by Hansen & Weisbrod. The two studies pointed out that the minimum total forgone civilian labor productivity under the voluntary system is smaller than that of the draft system because the draft system induces additional social costs in making selections among men eligible for the draft without reference, in general, to their opportunity cost.

Walter Y. Oi divided accessions into three groups: volunteers, reluctant volunteers, and draftees. Then, he computed the economic cost by asking how much should be paid to make reluctant volunteers and draftees who enlist in the armed forces. Hansen & Weisbrod noted that the draft system induces the distributive effects between servicemen and civilians. The draftees receive relatively low military pay instead of civilian opportunity cost. That means the difference between the two is an implicit tax on the draftees. This implicit tax on draftees-which involves a redistribution of income from draftees to civilians-is what he means by “distributive effects.” Also, he said that the draft system constrains the labor mobility, given individual utility functions, and produces a variety of uncertainty effects for both private employers and potential draftees. As a result, the draft created distortion in the allocation of

labor resource between military and civilian sector. In addition, they insisted that the draft system increases additional training and administrative cost within the military sector due to the frequent turnover rate of military manpower. He called these cost “allocative-efficiency cost”.

Two studies refer the occurrence of the allocative cost as the social cost of the draft system. This allocative cost, however, disappear if every man is mandated to serve in the military because there is no men left the civilian sector. To get clearer picture, it would be helpful if we classify the draft system into the selective draft system and all-draft system. The all-draft system is a military service system in which all men are drafted into the armed forces as a serviceman on active duty, while the selective draft system is a military service system which randomly selected men are drafted into the armed forces as long as supplies of volunteers fall short of fulfilling requirements for the strength objectives.

1) Allocative cost of the Selective draft system

Figure 1: Allocative Cost of the Selective Draft System

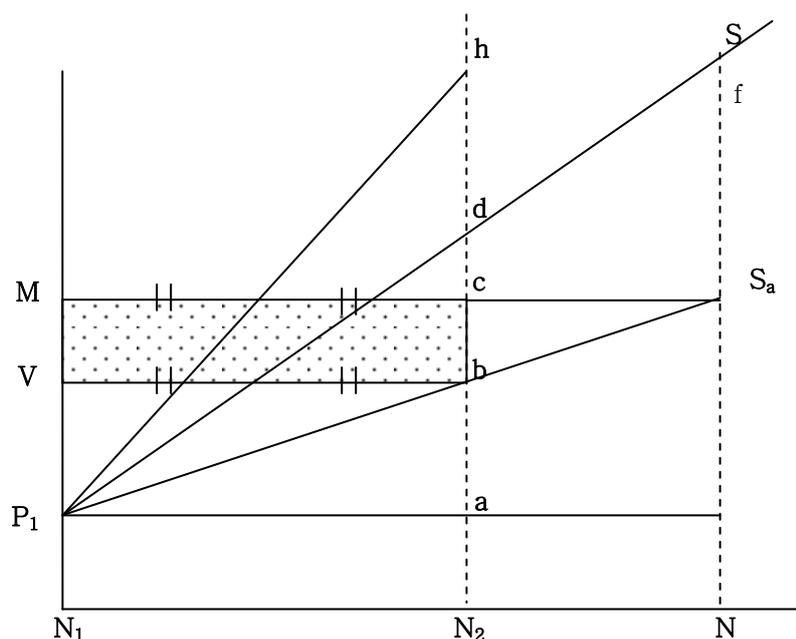


Figure 1 explains the allocative cost of the selective draft system that the U.S implemented in the 1960s. The supply curve of military personal, measured by each individual's marginal productivity in the civilian sector is given by S. In Figure 1, S_a is the average productivity. In Figure 1, under the voluntary system the forgone total product in civilian sector is $N_1N_2dp_1$ if the armed forces employ N_1N_2 . Since the average product at this level of military employment is N_2b , by multiplying it with N_1N_2 , we can have another equivalent total product measure, N_1N_2bV .

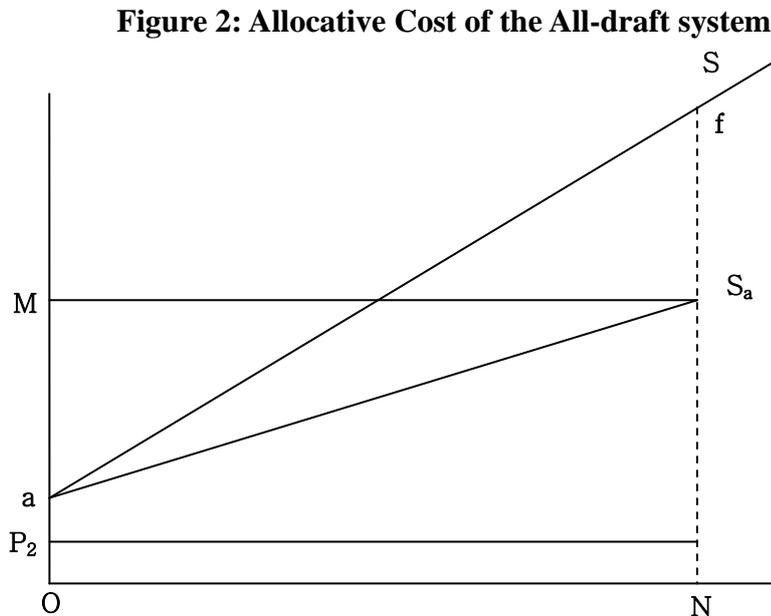
Under the draft system, however, N_1N_2 is randomly selected from N_1N , the total number of eligible men. Therefore, the average product is not N_2b but $NS_a(=N_1M)$, and the associated total product foregone is N_1McN_2 , which is larger than N_1VbN_2 . The difference between two is $VMcb$, the dotted area in the Figure, and is referred as the social cost of the selective draft system in the literature. Hansen & Weisbrod called this cost "labor-mobility cost" and regard it as a part of allocative efficiency cost. Another ways of representing the same cost is to draw a line from P_1 that passes through the mid-point of MC line segment; then the area covered by the triangle P_1hd represents the same social cost, which comes from the fact that the selection is made randomly with no regard to the opportunity cost foregone.

To sum up, the social cost of the selective draft system means allocative cost due to the random selection of draftees among labor pool without reference of civilian opportunity cost.

2) Allocative cost of the all-draft system

In the case of South Korea which has implemented the all-draft system, there is no allocative social cost, like that of the U.S., because all eligible men are drafted into the armed forces,

and therefore there is no selection involved. Figure 2 shows the allocative cost of the all-draft system. S is the cumulative distribution of values of civilian labor productivity for all men and S_a is the average curve of S .



In Figure 2, to employ labor resources of ON in the military sector, the foregone total civilian labor productivity is $ONfa$ under the voluntary system, and OM ($=ONfa / ON$) is the corresponding average. On the other hand, under all-draft system the foregone total civilian labor productivity to employ ON is also $ONfa$; it is same as the total civilian labor productivity lost in the voluntary system. Namely, there is no additional allocative cost induced by the draft system. Strange as it may sound, it is [very] intuitively reasonable. Considering the fact that the allocative cost of the selective draft system is produced by a random selection from all draftable men, the allocative cost by randomness and uncertainty is not produced under the all-draft system since it is mandatory for all qualified men should enlist in the armed forces.

Consequently, the claim that the voluntary system is better than the draft system because the draft system involves allocative distortion, appears not applicable to at least the all-draft

system since the all-draft system doesn't produce additional allocative cost. However, we should be careful here in that the allocative cost means only the cost produced in the process of procurement of draftees to replenish the shortage for the strength objective besides volunteers not total social costs of draft system. The reason that the preceding studies didn't make a statement about the allocative cost of all-draft system is associated with the fact that the U.S. didn't implement the all-draft system at that time. Accordingly, we need to take a look at other aspects of the social cost besides the allocative cost.

2.1.2. Deadweight Loss

If we consider only the allocative cost of the kind mentioned above we can be misled to think that the all-draft system is better than the selective draft system. However, that is because the preceding studies didn't deal with optimal allocation of labor resources between civilian sector and military sector. The preceding studies only covered how much cost would be produced given the size of the force strengths, taking military manpower "need" as exogenously given without considering optimal allocation of labor resources. Thus, in this part, let's examine how the deadweight loss is produced by misallocation of the labor resources between the civilian sector and the military sectors.

Let's suppose that industry consists of the civilian sector and the military sectors. If so, the qualified men in a specific age group (in the case of South Korea: from 19 to 31 years old) will be hired by either in the civilian or military sectors.

$$N = M_n + C_n \tag{1}$$

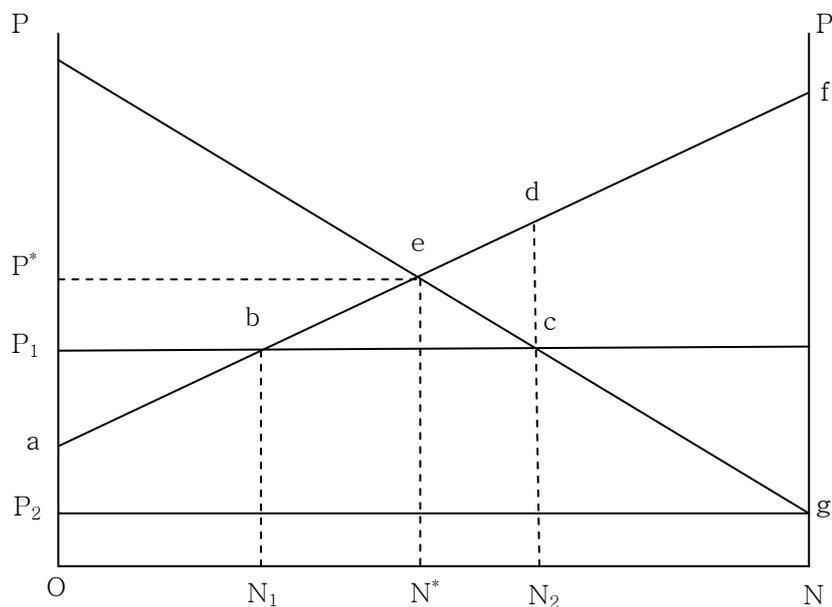
N: Total men hired by the military and the civilian sectors

M_n : the number of men hired by military sector

C_n : the number of men hired by civilian sector

Figure 3 shows the marginal productivity of the military and the civilian sectors as hire one labor unit, respectively. Right downward curve shows the marginal productivity (MP) size as military sector hires one labor unit, and left downward curve shows the marginal productivity size as civilian sector hires one labor unit. Generally, we can say that the MP of last labor unit of military sector (point g) is lower than civilian sector because the MP of surplus labor of military sector is very low if the armed forces have attained enough strength forces required. That's why the lowest pay of the military is less than that of the civilian sectors. Under the draft system we can often see that the draftees are made to do fatigue duty, which shows a typical example of why the MP of surplus labor of the military is very low.

Figure 3: Marginal Productivity of the Military and the Civilian Sectors



In Figure 3, the real output of society will be maximized at the point e, which is the intersection of the MP curve of military sector and the MP curve of civilian sector. Namely,

the optimal allocation of labor resources is to allocate the ON^* (M_n) number of men to the military sector and NN^* (C_n) number of men to the civilian sector. For example, the MP of military sector is higher than the MP of civilian sector for the labor resources of ON_1 . So, in this case, the military sector will increase employment of labor resources to the right side until ON^* . On the other hand, if the MP of civilian sector is higher than the MP of military sector for the labor of ON_2 , the civilian sector will increase the employment of labor resources to the left side until NN^* . Finally, the national total output will be maximized when both sectors hire ON^* men and NN^* men, respectively.

From now on, let's assume that the military and civilian sectors are in free-market. If so, the MP is the same as the pay level when both sectors should give to the labor sources employed. If there is no restriction in the market, military and civilian sectors will employ N^* men at the pay, P^* , respectively. That is because military and civilian sectors do not have any reason to employ additional labor if its pay level is higher than the MP of labor by employing per one labor unit.

Here, the assumption of free-market is the same as the voluntary system in the light of military service system because under the voluntary system individuals select whether he applies for the armed forces or works for the civilian sector considering his opportunity cost as compared with given level of pay, P . Under the draft system, however, the military doesn't have any interest about optimal allocation of labor resources because the military sector can conscript the military manpower requirement irrespective of their civilian opportunity cost and intention. Therefore, the draft system produces deadweight loss by employing labor resources in excess of optimal labor by artificially setting the pay low from society's standpoint. It is no wonder that the draft system induces deadweight loss because the civilian

labor with a high MP is employed by the military sector which requires lower MP.

The size of deadweight loss is different under the selective draft system and all-draft system. In Figure 3, the size of deadweight loss of the selective draft system is measured to Δecd when pay level is P_1 . Under the voluntary system the military sector can only employ labor of ON_1 at the artificial P_1 . However, since the military sector can conscript mandatory military personnel under the draft system, the military sector will employ the labor resources by ON_2 until the MP curve of military sector meets with P_1 . As a result, since the civilian sector can not employ the labor quantity of N^*N_2 , deadweight loss is produced as much as Δecd .

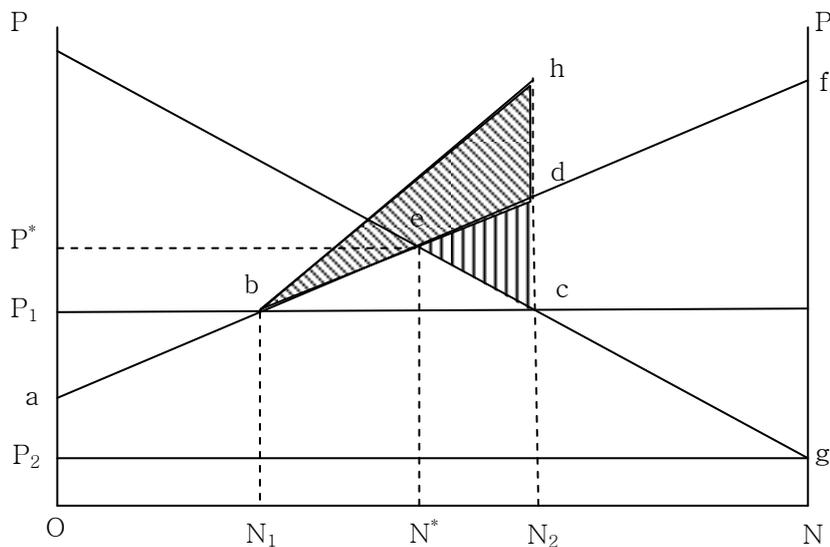
On the other hand, the size of deadweight loss of the all-draft system is Δegf , which is larger than the size of the selective draft system. In case of the all-draft system, the level of pay is set at the P_2 lower than P_1 because military sector can conscript all qualified men with low pay level. That is, the military sector sets the pay level to the MP of the last labor unit. As the military sector uses all labor quantity of ON , which is larger than optimal labor quantity of ON^* , as a result, there is no labor quantity that the civilian sector can use. Therefore, as the civilian sector doesn't use labor resources of N^*N , which would attain the higher MP, the all-draft system produces deadweight loss of Δegf , which is larger than deadweight loss (Δecd) under the selective draft system.

It is definitely true that the draft system produces the deadweight loss regardless of the category of draft system. Namely, the draft system reduces real national product below the level which could be attained with any given level of aggregate resource use by allocating labor in excess of optimal labor level to the military sector. Actually, the allocation of labor resource between the military and civilian sectors is very important because we can have a

limit to recognize the exact social cost of the draft system, if only we consider allocative cost produced in process of selection of draftees without consideration for the deadweight loss caused by the misallocation of labor resources.

Let's turn to the social cost of a selective draft system and all-draft system. Now, we can say that social cost of the selective draft system is the sum of deadweight loss (Δecd) produced by using the additional labor resources of N^*N_2 and the allocative cost ($MVbc$ in Figure 1) produced by selecting the labor resource of N_1N_2 randomly out of ON . This is illustrated by the following Figure 4. Here, the size of $MVbc$ in Figure 1 is same as the size of Δbdh . So the social cost is the size of $becdh$

Figure 4: The Social Cost of the Selective Draft System



On the other hand, the social cost of all-draft system is only deadweight loss (Δefg) produced by using all men (additional labor resource of N^*N), but the allocative cost is not produced under the all-draft system.

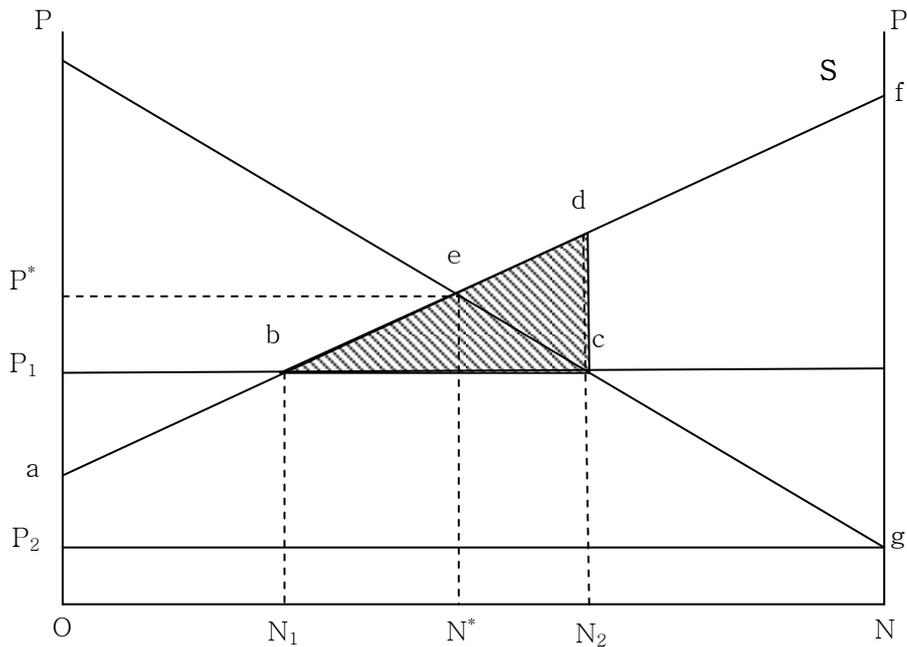
Then, how can we measure the size of the deadweight loss? As we see in Figure 3, we have to

find the equilibrium of military labor market and measure the marginal productivity of the excess labor resources. However, it is not easy to find the equilibrium of military labor market. To do so, we need to express many variables numerically to decide which force strengths level is optimal from a national standpoint, but there are many limits. Especially, some variables such as the security threat, historical experience and nation sentiments are very difficult to express numerically. So, many preceding studies have focused on the allocative cost rather than deadweight loss in connection to the social cost. However, there is no room for doubt that the social cost of the draft system should be considered the deadweight loss.

2.2. The Equity of Tax Burden

So far, we know that the draft system produces the social cost such as deadweight loss and allocative cost as compared with the voluntary system, and does not maximize national total output. On the other hand, another issue associated with the draft system is about the equity of tax burden. As mentioned above, the military uses additional labor resources through conscription, except for volunteers, under the draft system. Since the draftees receive lower military pay than their civilian pay, the difference of pay is induced between two sectors. So, unfavorable distributive effects occur to the draftees. That is because the current draft system imposes an implicit income tax on draftees by letting the draftees receive low military pay and give up their civilian pay. If draftees were not thusly “taxed,” taxpayers would pay larger explicit taxes under the voluntary system. Figure 5 shows how much the implicit income tax is under the draft system.

Figure 5: Implicit Income Tax



Let's assume that S , the distribution of labor productivity, is the pay which labor resources can receive in the civilian sector. Then, S is the same as the foregone civilian income draftees can make under the draft system. Under the selective draft system, the foregone total civilian income of draftees of N_1N_2 is the N_1N_2db , and the actual total military income of draftees is the N_1N_2bc . So, the draftees are imposed an implicit income tax of Δbcd , which is the difference between N_1N_2db and N_1N_2bc . On the other hand, under the all-draft system implicit income tax imposed on the draftees is aP_2gf , and it is larger than that of the selective draft system (Δbcd)

Generally speaking, one of the merits of the draft system is to maintain a desired level of defense capability alleviating the financial burden for government and the tax burden for taxpayers. So, the budget for operating military personnel is N_1N_2cb , which is the total payment of the draftees. However, as we see in Figure 5, the real budget of the Military Defense is the sum of N_1N_2cb and additional Δbcd . The real cost of the selective draft system is sum of the defense budget for operating draftees and the implicit income tax.

There is no reason for civilian to object to the draft system because the draft system reduces their explicit tax burden. But from a standpoint of a draftee, apparently the draft system produces unfavorable distributive effects to them. Accordingly, the equity problem of tax burden on the draftees will be continuously raised under the draft system. Actually, during the early 1960' the U.S. society became increasingly concerned with the growing inequity of the implicit tax on draftees, but at that time, "Universal Military Training Act" wasn't really "universal," and the "tax" which it imposed remained selective and discriminatory before shifting to the voluntary system.

2.3. Other Issues

The social cost and equity of tax burden mentioned above are problems between the military sector and civilian sectors. However, following issues relevant to the draft system are confined largely to problems within the military sector and civilian sectors, respectively.

2.3.1. The Structure of the Military Defense

The recent warfare has taken up the form of using advanced weapons compared to the use of massive military manpower. We can observe the importance of advanced weapons easily through examples such as Gulf-war, Iraq-war, and so on. Considering that the defense power is composed of the military manpower and capital equipment, strong defense power can be attained by the investment for the more capital equipment like advanced weapons.

However, there are some opinions that the draft system has a limit to build up a strong defense power because the draft system has a tendency to increase the ratio of labor input. The draftees receive low military pay controlled artificially by conscription while the capital

equipment is obtained in private, uncontrolled markets. So, the relative price of labor and capital equipment is inevitably distorted in the military sector, thus the result is that relatively cheaper forces are injected into the military in more numbers than is actually required. That is, relatively small investment for the expensive capital equipment brings out military “over staffing.” Therefore, the draft system leads the military sector into having manpower-oriented troops instead of capital equipment-oriented troops. We can often observe that countries implementing draft system have manpower-oriented troops rather than capital equipment-oriented troops, since they can use labor forces chiefly as compared to countries with voluntary system. Finally, the military structure of manpower-oriented troops, which is has a limited contribution to building a strong military strength, results from disregarding the difference between budgetary cost and opportunity cost of draftees.

2.3.2. Training and Administrative Cost

Under the draft system the turnover of manpower continuously takes place according to the fixed military service periods. If service period is shortened, the rate of turnover will be increased, and more and unnecessary training and administrative cost will incur. This means the increase of training and administrative cost for the new recruits, and this cost can be ruled out completely under the voluntary system.

From the viewpoint of the armed forces, it is very important to keep the number of “ready” men (hereinafter denoted as R), not merely the number in uniform (N). That is, men involved in training-either as new recruits or as instructors or administrator of these new recruits-are not ready, although the instructor-administrator cadre could be withdrawn from those activities. So, the military have to increase the draftees to keep R when military service period is shortened. Consequently, this results in the increase of training and administrative

cost for the recruits. Moreover, this will result in the increase of required training and administrative personnel, which will also incur additional cost; this also means that we would need more draftees to supplement those training and administrative personnel, who have been dispatched elsewhere.

The relationship between R and N can be stated as follows²;

$$N = \frac{1}{s}pN + \frac{1}{s}pkN + R, \text{ or}$$

$$N = \frac{R}{1 - \frac{p}{s}(1+k)}$$

Where:

S is the average period of service of draftees, in months (1/s is the turnover rate);

P is the training period for draftees, in month;

K is the ratio of training personnel to trainees;

N is number of draftees; and R is combat –ready men.

The first term on the right-hand side of the first expression above indicates the number of men in uniform who are in training at a given point in time; the second term indicates the number of instructors and administrators, which is assumed to be a fixed fraction of trainees; and the final term indicates the number of ready men. It is clear from the equation that if the ready men are increased and service period is shortened, then more draftees will be needed. In South Korea’s case, the military has kept the number of combat-ready men by shortening the period of recruit training when the service periods are shortened. But since the shortening of recruit training has a limit, thus excessive shortening of service period is not likely to secure the number of combat- ready men. Of course, the training and administrative cost will

² W. Lee Hansen and Burton A. Weisbrod, “Economics of the military draft.”1967.

go up with the reduction of service period. That's why the voluntary system can reduce cost related with training and administration, if the average duration of service is increased.

2.3.3. Impact on Future Income

The draft system results in not only the distributive effects of income due to the implicit income tax but also as other additional cost. A typical example is the wide gap in income difference that arises due to the cessation of college and vocational training due to conscription in the military. There has been no precedent in South Korea in regards to the wide gap in income difference, however, according to the research carried out by Guido, Imbens; Wilbert van der Klaauw(1995)³, in the case of the Netherlands, the future income between those who stopped work due to conscription and those who did not showed difference of 5 % in their future income. Also, the results of Angrist's research (1990)⁴ show that those soldiers who fought in the Vietnam War lost 15% of their potential income. The loss of potential income may differ from country to country, however, it can be shown that loss of potential income can be observed in the draft system and also the fact the wide gap of income difference exists among draftees and the exempted.

2.3.4. The Problem of the Conscientious Objector

One of the problems caused by the draft system all over the world is whether governments permit the right of conscientious objector or not. The U.N. Human Rights Commission has repeatedly urged the Korean government to make alternative services available to conscientious objectors. However, many countries (North Korea, China, Israel and so on) under the draft system do not permit the right of conscientious objector. That is, it shows that

³ Guido Imbens; wilvert van der Klaauw, "Evaluation the cost of conscription in the Netherlands", Journal of Business & Economic Statistics, Vol. 13, No. 2, JBES Symposium on Program and Policy Evaluation. (APR., 1995), p.215

⁴ Angrist, J. D. (1990), "Lifetime Earnings and the Vietnam Era Draft Lottery: Evidence From Social Security Administrative Records," American Economic Review, 80, 323-335

permission of the right of conscientious objector depends on the security situation each country has faced with.

South Korea government does not permit conscientious objector to undertake alternative service. But, the problem is that, in the past, advocates who agree with the right of conscientious objector were confined within specific religious group, now the scope of conscientious objector is extended to include people of antiwar, objector for overseas dispatch of armed forces, and so forth on the basis of personal conviction. So, opponents and advocates for the right of conscientious objector have disputed about this until now. Also, it is a practical problem that the government can't ignore the recommendation of The U.N. Human Rights Commission for the human right of minorities.

Also, we can examine the problem about the right of conscientious objector in the light of economic cost. Conscientious objector must forgo their civilian opportunity cost by choosing to go to the prison rather than taking arms, and they have to cover the expense related with a lawsuit. Most of all, the conflict created by the discordance between opponents and advocates about the right of conscientious objector will be the most invisible cost.

3. The cost estimation of the draft system

As pointed out earlier, the social cost of a draft system is the sum of deadweight loss and allocative cost. But it is not easy to estimate the size of deadweight loss, thus many preceding studies focused on estimating the foregone total civilian earnings related with the allocative cost draftees have produced, as taking the force strengths given. They regard it as the cost of a draft system. Therefore, the cost of the draft system is the foregone civilian earnings of the draftees, which is different from the social cost conceptually.

The cost of a draft system can be divided into two. One is the financial cost, and the other is the economic cost. The former is the budgetary cost government must pay to the draftees implementing the draft system. Thus, financial cost can not reflect the draftee's civilian opportunity cost. On the other hand, the latter is defined as the sum of incomes draftees must forgo in civilian sector. The financial cost are the only cost government have to manage, but the economic cost is the cost society should recognize. So, it is desirable to regard the economic cost as the real cost of the draft system because the draft system just imposes the implicit income tax on the draftees instead of the civilian. Now, let's try to estimate the financial cost and economic cost of draft system in South Korea, and examine the difference between the two.

3.1. The Financial Cost

The financial cost, in plain terms, is the expense of operating military personnel (hereinafter denoted as EOMP)⁵ out of the military defense budget in a fiscal year. We can estimate the financial cost by multiplying the total draftees by annual EOMP per capita, it is described as below

$$\text{Financial cost} = \text{Total draftees} \times \text{Annual EOMP per capita}^6 \quad (2)$$

Total men drafted in the Army are shown in Table 1. Table 1 shows the status of recruits drafted from FY 2002 to FY 2006. Annually, the average recruits of 225K are supplied to the Army. Accordingly, we know that the annual total draftees necessary to the army (the force

⁵ It includes labor, meals, and clothing expense

⁶ $2,746,000 = ((233,000 + 226,600 + 220,000 + 236,000) / 4) * 12$; National Defense Expense Guide 2006: sergeant 233,000 won a month, corporal 226,000 won, private first class 220,000, private 236,000

strengths) are about 450K men, considering that the present service period of the draftees is 24 months. Of course, the necessary military personnel can be changed to some degrees per year, but hereafter, the 450K draftees will be fixed as the annual military personnel requirement.

Table 1: The Status of the Recruits in the Army

	Average	'02	'03	'04	'05	'06
Recruits	225,110	231,542	226,744	235,971	224,075	207,221

Source: Annual Report on the Army Statistics, 2007.

On the other hand, annual EOMP per man was approximately 2,746,000 won in FY 2007. Now, we can calculate the annual financial cost, the budgetary expense, by multiplying annual total 450K draftees by annual EOMP per man (2,746,000 won). Consequently, the financial cost is roughly 1,235 billion won⁷. If the pay increase and welfare policy of the draftees are considered in the future, the financial cost of the present draft system is expected to increase largely because the annual EOMP go up continuously.

3.2. The Economic Cost

The economic cost of a draft system is defined as the foregone total income (opportunity cost) of the draftees in civilian sector, and described as followings:

$$\text{Economic Cost} = \sum_{n=1}^{450,000} n^{\text{th}} \text{ Civilian Income} \quad (3)$$

With the above formula, the economic cost is determined by civilian pay level, and the larger

⁷ 450,000*2,746,000 = 1,235,700,000,000 won.

the civilian pay level is, the larger the economic cost will be. If we know the individual civilian payroll, it is very easy to calculate the economic cost of the draft system. But it is impossible to know each draftee's pay level because most of them are students who are not yet employed. If so, we have to assume that the individual's opportunity cost are the same as the pay level they would have received in the civilian sector. Generally, the civilian pay level is determined by education level and age. Table 2 shows pay level classified by the size by worker, education, and age as of 2005. The size by worker was included as one factor to determine pay level because the pay level can be differed by the size by worker even under same conditions of education and ages⁸. Here, I chose the maximum and minimum pay level according to the size by worker.⁹

Table 2: Pay Level by the Size by Worker¹⁰, Education, Ages

Education(Male)	Age	Monthly Payment ^a (won)		Annual Payment(won)	
		Min	Max	Min	Max
Under high school	-19	859,012	1,299,920	10,308,144	15,599,040
High school	20-24	1,134,795	1,312,131	13,617,540	15,745,572
Junior college	20-24	1,197,437	1,313,389	14,369,244	15,760,668
College & University	20-24	1,123,877	1,560,316	13,486,524	18,723,792

Source: <http://www.kosis.kr>

a. Regular payments and overtime payment except for annual special payment

In Table 2, there is little difference in payment between a man with a high school degree and a man with a college degree, it is interpreted as the difference caused by their career. I selected age groups of 20~24 in the statistics because the 95 percent¹¹ of draftees were men between the ages of 20 and 23.

⁸ Of course, pay level can be classified by the standards of industrial sectors.

⁹ See Appendix 1.

¹⁰ Worker by size: 5~9, 10~29, 30~99, 100~299, 300~499, over 500

¹¹ Military Manpower Administration, "Annual Report on military affairs", vol. 37.

Next, let's see about the educational attainment of the draftees in the Army. However, it is not possible to divide the draftees into the detailed educational groups, since the Military Manpower Administration (MMA) classifies the recruits with three educational groups; under high school, high school, over university including junior college. Table 3 shows the annual number of draftees and proportion of educational attainment. In Table 3, we can see how the annual draftees of 225,110 are classified with educational attainment.

Table 3: Annual Number of Draftees Classified by Educational Attainment

Year	Under high school		High school		Over university	
	Percentage (%)	Number	Percentage (%)	Number	Percentage (%)	Number
02'	0	0	23.9	55,339	76.1	176,203
03'	0	0	25.7	58,273	74.3	168,471
04'	0.1	237	20.0	47,194	79.9	188,540
05'	4.0	8,963	17.0	38,092	79.0	177,020
06'	3.8	7,874	15.6	32,326	80.6	167,021
Average	1.58	3,415	20.4	46,244	78.0	175,451

Source: Military Manpower Administration, "Annual Report on military affairs, vol. 35, 36, 37".

Now, we can calculate the annual economic cost of the recruits by multiplying the pay level classified with educational degrees of Table 2 by the annual number of recruits classified with educational degrees of Table 3. And the annual total economic cost of draftees can be estimated by adding up the annual economic cost of recruits to the economic cost of the existing draftees last year. At this point, let's assume that the economic cost of the existing draftees is same as that of the recruits. As a result, the estimated annual total economic cost of draft system in South Korea is roughly the maximum 8,132 billion and minimum 6,062 billion in Table 4.

Table 4: The Economic Cost of the Draft System

	Number ^a (man)	Annual payment (won)		Economic cost (billion won)	
		Min	Max	Min ^b	Max ^c
Under high school	6,830	10,308,144	15,599,040	704.0	1,065.0
High school	92,488	13,617,540	15,745,572	1,259.4	1,456.2
Junior college	-	14,369,244	15,760,668	-	-
College & University	350,902	13,486,524	18,723,792	4,732.4	6,570.2
Total	450,220	-	-	6,062.2	8,132.9

a. The service period is 24 months, so total number of draftees will be the double of the number of recruits.

b. The number \times the minimum annual payment

c. The number \times the maximum annual payment

In conclusion, from the standpoint of the country, the draft system induces the economic cost of maximum 8,132 billion and minimum 6,062 billion including the financial cost of 1,235 billion. That is, the draft system imposes the implicit income tax of the maximum 6,897 billion and minimum 4,827 billions on the draftees.

So far, we estimated the economic cost and financial cost of the present draft system. As the financial cost is lower than the economic cost, the government and taxpayer might prefer the draft system, but we can find that the draft system is not cheap military service system nationally if we compare the economic cost with the financial cost. Draftees just pay the implicit tax at the expense of their civilian earnings, thus the cost society is paying is not small at all. Especially, as the economy develops more and more, the gap between the economic cost and financial cost will be bigger than before. That is because it is difficult for the increase of wage rate of the military sector to surpass the increase of wage rate of the civilian sector. Also, it looks like the economic cost of the draft system will increase steadily as the percentage of draftees with university degrees goes up among the draftees as we see in Table 4.

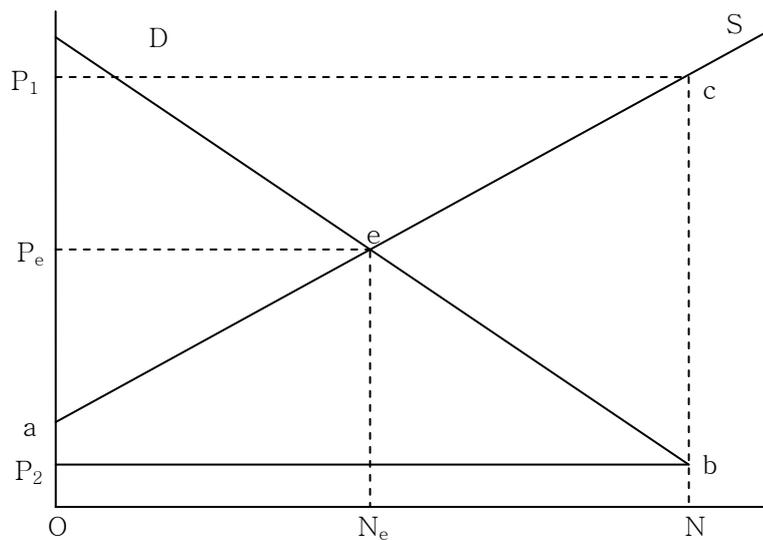
4. The Cost Estimation of Voluntary system

It is not certain whether there are some debates related to the voluntary system in the military. But it is obvious that it is impossible to keep the present draft system asking for many draftees as time goes, considering the current viewpoint of draft system, domestic problem of military manpower supply, and global trends over the military service system, and so forth. However, whether government moves to a voluntary system or not should be determined with prudence, since the transition of military service system has big ripple affection on the whole community. Accordingly, it is necessary to estimate the cost of a voluntary system to determine whether the government moves to a voluntary system or not in the future.

4.1. The Model

We can deduce the model for the cost estimation of voluntary system from Figure 2 of Chapter 2 with a little modification. Under an all-draft system like South Korea, the required recruits are drafted by national compulsion. As shown in Figure 6, all men are enforced to enlist in the military, and draftees receive low pay (P_2) arranged by the government. A voluntary system, however, has features which are an elastic demand (D) and a voluntary supply (S) on the basis of the given payment. That is, the payroll, P_e , determined in the market is higher than P_2 of the draft system. So, the payment level of a voluntary system is higher than that of draft system ($P_e > P_2$), but demand for the military manpower is less than that of draft system ($N_e < N$) as we see in Figure 6.

Figure 6: Model for the Cost Estimation of a Voluntary system



In Figure 6, under a voluntary system there will be no men to enlist in the military, given payment level of P_2 , because the payroll is too low than their marginal productivity. So, the pay will go up to the point e and the military will employ the military manpower of N_e for the demand without any restriction in labor market. On the other hand, let's suppose that the military needs the number of N of the force strengths. In this situation, it is inevitable to procure additional military manpower ($N-O$) to keep the strength forces of N men. These additional military manpower needs ($N-O$) can be supplied with payment level of P_1 under the voluntary system. Thus, if the government plans to convert the draft system to a voluntary system right now, the economic cost will be boiled down the size of $ONca$. That is, to estimate the cost of a voluntary system we have to know how much payment should be raised to attract the reluctant draftees to the armed forces, given the strength objectives.

On the other hand, the financial (budgetary) cost of P_2bcP_1 is bigger than P_2bca because P_2bca means just the economic cost. Of course, if the military can differentiate the volunteer's pay level depending on each civilian opportunity cost, the financial (budgetary) cost will be the same to the economic cost, but actually it is impossible to apply to various

pay level to the volunteers who are the same rank. So, usually the financial (budgetary) cost is bigger than the economic cost.

4.2. The Cost Estimation

We need a demand and supply curve in military labor market to estimate the cost as we see in Figure 6. So, let's see the aspects of demand and supply of military manpower in South Korea and then, let's try to calculate the cost of the voluntary system.

4.2.1. The Military Manpower Supply Curve

It is necessary to separate the volunteers from the draftees to get the supply curve for the military labor. That is because some of military men may be volunteers regardless of military pay level under the draft system. However, it appears that volunteers are rare, although there are not enough surveys and studies done in South Korea. We will only be able to regard the military manpower who applies for the noncommissioned officer in the middle of his service as volunteers. However, the annual number of these volunteers is about 2,000, which is less than one percentage of the annual recruits of 225,000men drafted. So, it would be no problem even if we assume there is no volunteer in South Korea among draftees. That means all draft-eligible men can be volunteers if the military pay is larger than their opportunity cost when they compare the military pay with their civilian opportunity cost. Of course, all men don't determine whether they enlist in the armed force or not with only factor of pay level, but here I will exclude other factors such as religion, personal faith, and so forth for the convenience of analysis.

As noted above, we need to know each individual opportunity cost to induce supply curve, but it is not easy to know it. The first problem is to determine who the qualified men are. In

case of South Korea, all 19-year-old men¹² are obligated to have physical examination for conscription, and they are classified into men passed or men rejected. We call men passed draft-eligible men. they are classified into the active duty or reservist duty again. So it is reasonable to regard the draft-eligible men out of men born in specific year as manpower supply pool. Of course, when The Military supplements the recruits annually, 19-year-old men don't compose of all recruits. But on average, it is obvious that the men born in a specific year supply the shortfall of military manpower of a specific year.

Table 5: The Status of Physical Examination for Conscript

Year	Pass (active duty, reservist duty)					Fail
	Sub total	University	High school	High school dropouts	Middle school	Physical /mental defect
04	310,994	225,903	73,927	10,047	1,117	12,007
05	302,367	221,864	71,741	7,763	999	11,011
06	291,945	217,351	67,896	5,942	756	10,642
07	301,930	228,580	67,080	5,569	630	10,865
Average	301,809	223,424	70,161	7,330	876	11,132

Source: Military Manpower Administration, "Annual Report on military affairs, vol. 37."

The status of physical examination for conscript during the last four years appears in Table 5. As a result, on average 301,809 males passed the examination, 11,132 males didn't pass the examination. Of males who passed the examination, the university graduates were 223,424, and the high school graduates were 70,171, and under high school male were 8,206. So, the available number of supply labor resources will be the average 301,809 males who passed the physical examination for conscript.

The second problem is to determine the individual opportunity cost. In other words, given the

¹² The qualified man can be woman, but that is out of the range in this paper.

pay level, who will be the volunteers out of the draft-eligible men? If we assume that the individuals opportunity cost is same as the civilian pay of them, we can presume whether the individual enlists in the armed forces or not with two ways. First thing is to assume that males having the lower civilian opportunity cost will enlist in the armed forces voluntarily by applying the pay level by education degree to all draftable men. Hence, the order of enlisting in the military will be the under high school, high school, and university graduates. This method is similar to the method of estimating the economic cost of the draft system. However, the first method has a demerit which can not reflect other factors of opportunity cost because the present opportunity cost is classified by only one factor, pay level by educational degrees. Also, the first method can bring about social misunderstanding as if the qualification of enlisting in the armed forces is determined by academic careers. So this method has a limit as a method to judge individual opportunity cost.

The second method is to estimate the number of volunteers as given each pay level, then to regard the pay level as each volunteer's opportunity cost. Thus, we can say this method is a reasonable because this makes volunteers determine their opportunity cost by themselves by reflecting various factors as well as educational degrees as their opportunity cost.

However, it is impossible to ask all men individually which pay level is necessary to be a volunteer. So, if we check the distribution of pay level of men aged 19 to 24 having the duty of national defense in the civilian sector, we can know how the pay of average annual draft-eligible men aged 19 (301,809 men) will be distributed in the future. Table 6 shows the distribution of workers in civilian sector by pay level and we applied the average annual draft-eligible men of 301,809 to the distribution of workers by each pay level in the civilian sector.

Table 6: The Distribution of Workers (aged 19~24) by Civilian Pay Level and Average Annual Draft-eligible Men (aged 19) in 2006

Pay level (thousand won)	Annual Pay (thousand won)	Number of worker (19~24)	Percentage	Draft- eligible men	Cumulative Draft- eligible men
			1.000	301,809	301,809
800	9,600	12,323	0.068	20,398	20,398
900	10,800	10,561	0.058	17,481	37,879
1,000	12,000	12,642	0.069	20,926	58,805
1,100	13,200	17,119	0.094	28,336	87,142
1,200	14,400	18,440	0.101	30,523	117,666
1,300	15,600	19,909	0.109	32,955	150,621
1,400	16,800	16,339	0.090	27,045	177,667
1,500	18,000	14,662	0.080	24,269	201,937
1,600	19,200	13,360	0.073	22,114	224,051
1,700	20,400	10,883	0.060	18,014	242,066
1,800	21,600	7,568	0.042	12,527	254,593
1,900	22,800	5,853	0.032	9,688	264,281
2,000	24,000	4,850	0.027	8,028	272,310
2,200	26,400	5,948	0.033	9,845	282,155
2,400	28,800	4,602	0.025	7,617	289,773
2,600	31,200	2,247	0.012	3,719	293,492
2,800	33,600	1,669	0.009	2,762	296,255
3,000	36,000	940	0.005	1,555	297,811
3,500	42,000	1,209	0.007	2,001	299,812
4,000	48,000	877	0.005	1,451	301,264
4,500	54,000	171	0.001	283	301,547
5,000	60,000	129	0.001	213	301,761
6,000	72,000	19	0.000	31	301,792
7,000	84,000	10	0.000	16	301,809

Source: <http://www.kosis.kr>

In Table 6, the first column and the second column show monthly pay level and annual pay level, respectively. The third column is the distribution of workers aged 19 to 24 by each civilian pay level, and the fourth column is the percentage of workers at given each pay level. Here, the distribution of workers by pay level is described as below.

Figure 7: The Distribution of Workers by Civilian Pay Level

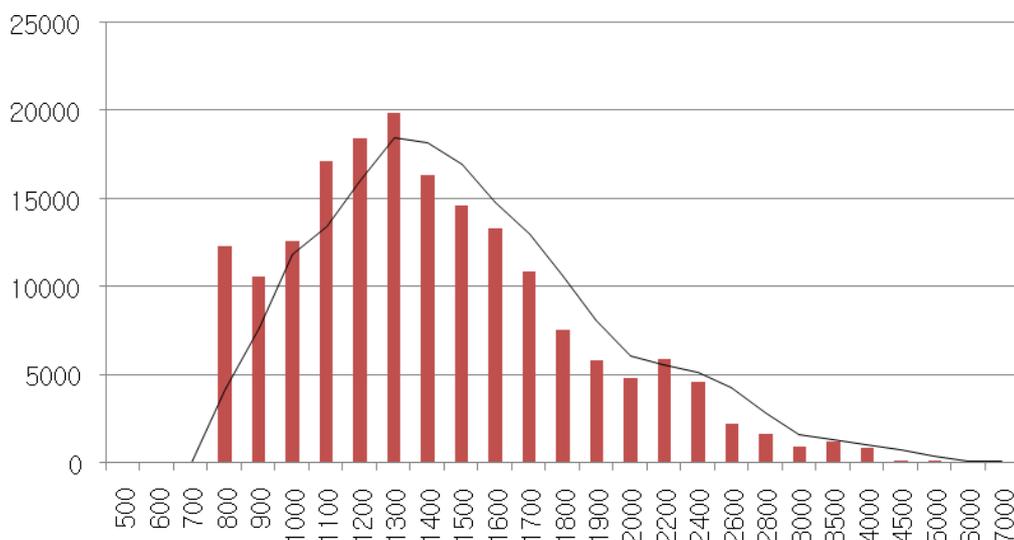
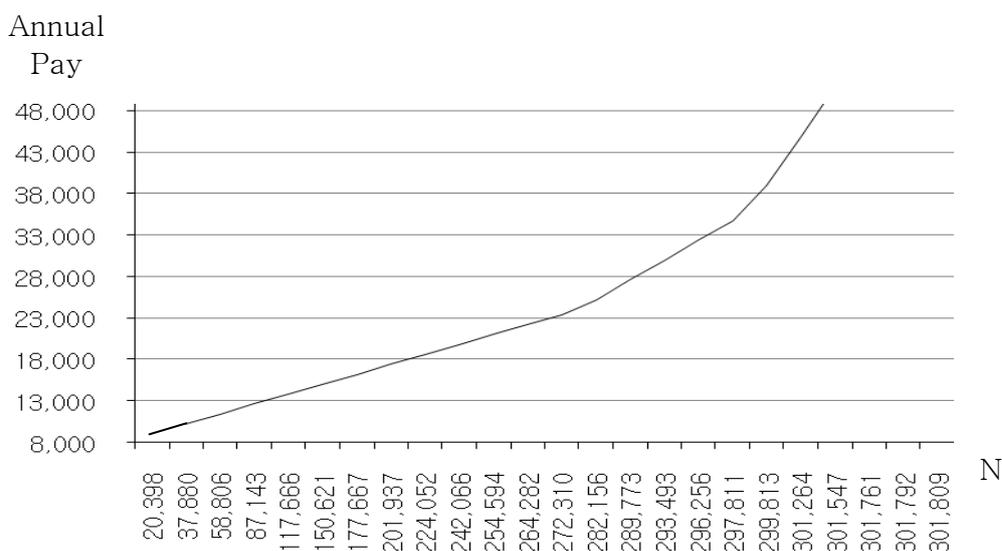


Figure 7 is not a normal distribution, but it is close to the normal distribution. So, if we assume that the average annual draft-eligible men follow this above distribution, their distribution will be the fifth column in Table 6. Now, it is possible to draw the supply curve of military personnel based on the cumulative distribution of the draft-eligible men by the annual pay level. Supply curve is as follows.

Figure 8: Supply Curve of Annual Military Manpower



If the Army moves to a voluntary system in 2007, the supply curve the Army faces will be like that of Figure 8. From this supply curve, we can see how much the draft-eligible men enlist at given each military pay level. Also, we can estimate the cost of transition to the voluntary system throughout the supply curve. For example, if the Army decided to select the required recruits of 200,000 men with voluntary supplies of personnel, the Army should pay 18,000K won to each recruit annually to secure the planned military manpower.

However, the actual supply curve the Army faces might be different from the supply curve above. First, we assumed that the distribution of the draft-eligible men follows the distribution of the workers by civilian pay level, but this might not be true in reality. We selected the distribution of workers aged 19 to 24 by each pay level. But if we enhance the age scope from 19~24 to 19~29, it is totally different story. Usually, more workers are distributed in the age group of 25~29 than 19~24. That is because most of the men aged 20~24 are students, or they serve in the military instead of having a job. That means men aged 25 to 29 are distributed to high pay level rather than low pay level relatively. As a result, pay level by age group of 19 to 24 is likely to be biased downward than pay level of age group of 19 to 29.

Second, even though the distribution of the draft-eligible men follows the above distribution, the pay level was the only opportunity cost of the draft-eligible men as they work in the civilian sector. But, in reality, if the draft-eligible men have aversion about the military service the Army should pay them more money than volunteers. Walter Y. Oi explains this as follows; when the civilian payroll (C) is the same as the military payroll (M_0), an individual with an aversion for service live would elect to remain in civil life. If so, the military should give more military payroll (M_1) to the individual, thus they will be the volunteers only when

following condition of $M_1=(1+\delta)C$ is satisfied depending on each individual's aversion degrees to the military life. In other words, the δ is an equalizing differential which makes an individual indifferent between employments in the two sectors. Walter Y. Oi called equalizing differential δ occupational preferences. Consequently, the above mentioned distribution may not reflect these occupational preferences.

Third, above supply curve is not only what the Army faces but also what the Navy and the Air Force face. So, depending on individual preference, some will choose the Navy and the Air force under the same condition of military payroll, thus the supplies of labor for the Army could be smaller than before. But, let's suppose all draft-eligible men will choose the Army first in estimating cost since then. Even so, there is no problem because the total cost of the military is not changed.

Lastly, the supplies of labor by the pay level can be differed according to unemployment rate. Stuart H. Altman & Alan E. Fechter said that unemployment rate has a positive relationship with the supplies of military manpower in their paper. They stated that a rate of voluntary enlistment with the 5.5% of unemployment rate is higher than the 4% of unemployment, and a pay increase with the 5.5% of unemployment rate is smaller than the 4% of unemployment to attract the reluctant volunteers, when they assumed that the unemployment rate was the 4% and the 5.5%, respectively. There is no research pertained with an unemployment rate in South Korea yet, but we can expect more males will enlist in the Army, if unemployment rate is high. In other words, it is possible for men to serve in the Army although the Army payroll is lower than their civilian opportunity cost. However, it seems that the more demonstrative studies are required about this. For example, job seeker say, "unemployment rate is too high, so it is not easy to get a job," but they still avoid working for the small and medium

companies in spite of an adequate supply of jobs. Hence, it is dangerous to affirm whether volunteers would be enough with a high unemployment rate without actual studies in South Korea.

4.2.2. The Military Manpower Demand Curve

The demand¹³ for the military manpower is determined by various factors such as national income, military pay level, the rental cost of military capital, international tension, and national security, and so forth. Of course, the demand for military manpower is determined minimizing the total foregone civilian real output. But, as pointed out earlier, it is not easy to determine how much demand is the optimal level for the society. So let's assume that the strength forces is given from outside on the demand side. Here, the outside means the Military Defense. Namely, the demand for military personnel is determined by the Military Defense as a whole given the supply curve under the draft system. Of course, even with the voluntary system, the Military Defense still remains as a decision maker for the demand for military manpower. If there are different points between two systems, under all-draft system all qualified men should be drafted in terms of the equity of military service by coercive power, while under voluntary system the necessary military manpower are supplied by the volunteers.

If so, which level are the optimal force strengths for the Army. The Military Defense made a statement the strengths objectives to be kept until 2020 by the Military Defense Reform Law (another name is *Military Reform 2020*). The Military Defense stated that it will reduce the current (2006) force strengths including officers and noncommissioned officers from 680,000

¹³ $L=L(Y,w,r,I)$, Y = national income, w =the military wage, r =the rental cost of military capital, and I = a measure of international security conditions. (Larry deboer & B. Wade Brorsen)
Larry deboer & B. Wade Brorsen. "The Demand for and Aupply of Military Labor." southern economic journal (1989): 857.

to 564,000 by 2010, to 560,000 by 2015, and to 500,000 by 2020. Also it stated that the ratio of officer and noncommissioned officer should be the 40 percentage by the law enacted. Based on the stated force strengths by the law, if we estimate the number of soldiers needed, the result is described as below.

Table 7: The Force Strengths by the Military Reform 2020

	Unit: ten thousand			
	2006	2010	2015	2020
Total	68	64	56	50
Officer & NC officer	17	18	19	20
Soldiers	51	46	37	30
The Army^a	45	40	31	24
Other services	6	6	6	6

Source: computed by author from data using the Military Reform 2020

a. It is estimated under the assumption that the number of soldier of the Navy and Air Force are fixed

In Table 7, the military manpower requirement will be 300,000 men by 2020, which is the reduced military manpower by up to 210,000 as compared with 510,000 as of 2006. In the case of the Army, the present force strengths are 450,000 as of 2006, but it seems to be reduced to 240,000 by 2020, which is the reduced manpower by up to the 40 percentage compared with 2006. Here, 240,000 men is the necessary military manpower under the draft system, but even under the voluntary system, we can presume over 240,000 men will not be needed any more since 2020.

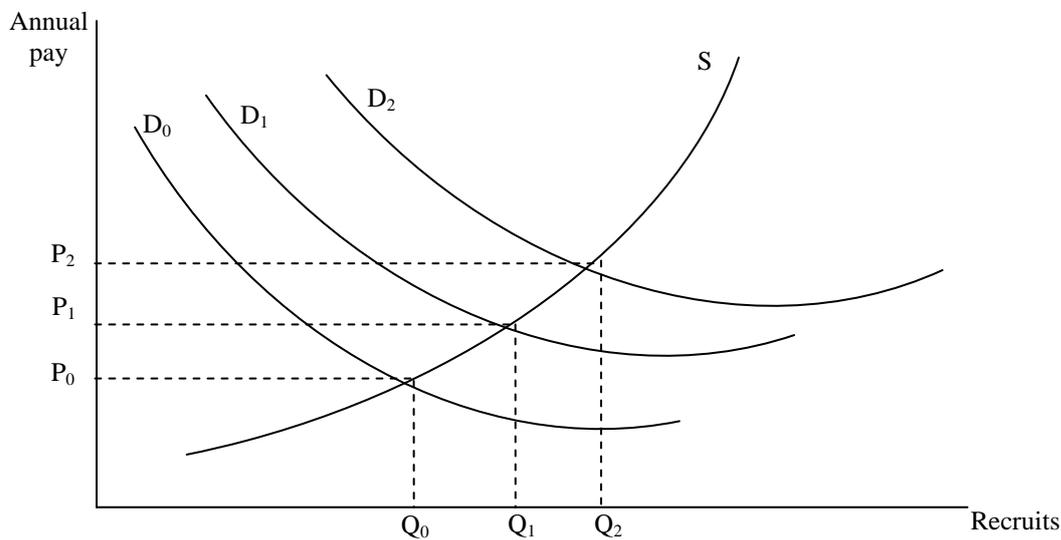
Therefore, I will apply the force strengths determined by the Army to the demand for the military manpower. Also, since the service period affects the demand for military labor, I will explain about this later in estimating the cost.

4.2.3. The Equilibrium in the Military Labor Market

The equilibrium in the military labor market is determined between the demand and supply of military manpower. However, since we assume that the demand for military labor is given from the Army, the equilibrium in market is determined by the supply of military manpower. That is because the Military Defense should secure the necessary military manpower no matter how high the pay level is. For example, if the numbers of recruit requirements are 100,000 men annually, Military Defense will give the military pay corresponding with the civilian pay of the reluctant volunteers to secure the necessary manpower.

The Figure 9 shows that the equilibrium in the military labor market. At the each equilibrium, the payroll and quantity of labor are determined.

Figure 9: The Equilibrium in the Military Market



In Figure 9, if the demand for the recruits is Q_0 , the annual pay level of the Army is P_0 . If the Army increases the recruits from Q_0 to Q_1 , the pay increase is needed from P_0 to P_1 . Already we assumed Q is the given military demand, thus Q_0 , Q_1 , and Q_2 stand for the number of recruits of the Army like the force strength of 240,000, 310,000, and 400,000, respectively.

So, the equilibrium of the military labor market is determined by supply curve in this case.

4.2.4. The Alternative Pay Standard of Equilibrium Price.

We already mentioned about the equilibrium price in military labor market. However, we may have trouble in applying this equilibrium price in reality because the equilibrium price is not suitable if it is induced from a biased supply curve with many reasons. So, if we have applicable alternative pay standard of equilibrium price, it is a very useful method to estimate the cost of a voluntary system. In the light of this point, we need to examine the payroll of the Paid-Draft System (PDS)¹⁴, which has been implemented since November 16, 2007 in South Korea. We can't say this PDS is the same as the voluntary system but is similar to a voluntary system because draftees can choose a specific sector they want to serve in the Army with their intention.

The service type of PDS is divided into two types. Type 1 is to extend their serve periods from 6 months to 18 months after completing their obligatory duty in the Army. Type 2 is to serve in the Army for 3 years with obligatory duty. (The present service periods are two years). The pay of Type 1 is monthly 1,200K won, the pay of Type 2 is monthly 1,800K won including special pay of 600K won

If so, which pay level is applicable to the voluntary system as the alternative pay out of two?

The selection reason of the men of Type 1 and Type 2 is the same but qualification of men is different. In case of Type 1, the qualified applicants are the men who complete the military duty service. Namely, they will reenlist in the Army by comparing military pay with their civilian opportunity cost. On the other hand, in case of Type 2, applicants are men who still

¹⁴ Of course, under the present all-draft system the draftees are paid. But the pay level is too low to call it "pay" actually. That's why we call this military system "Paid-draft system"

have obligatory military duty. Hence, they can't choose the sector they work in between military and civilian sectors. They just choose to be the volunteers or draftees to serve in the Army. Consequently, it is reasonable to apply the pay of Type 1, 1,200K won, as the alternative pay standard to estimate cost of a voluntary system.

4.2.5. The Cost Calculation

I will focus on how much cost will be incurred depending on the each force strengths when I apply the annually reduced force strengths by Military Reform 2020 to the demand for the military manpower as of 2006. I will use each force strengths of the Army as the demand for the military manpower and the cumulative distribution of the draft-eligible men by each pay level as the supply for the military manpower.

The cost estimation of a voluntary system can be divided into economic cost and financial cost likewise the draft system. The economic cost is the cumulative cost which is calculated by multiplying the number of draft-eligible men of each pay level by the corresponding pay level. On the other hand, the financial cost can be calculated by multiplying the cumulative number of draft-eligible men by the last pay of cumulative draft-eligible men.

As mentioned above, the cost estimation of a voluntary system can be differed depending on the service period even with the same force strengths. For example, if the Army needs the force strengths of 240,000 men, annual recruits to be supplied are 120,000 men if the service period is 24 months, but annual recruits to supply are 80,000 men if it is 36 months. Thus, the total cost is changed by cumulative distribution of the draft-eligible men by pay level because the draft-eligible men of high pay level are not needed as long as the service period increases. So, the service period is a very important variable in estimating the cost.

In this paper, I will estimate the cost of a voluntary system with two cases. Case 1 is that the service period is 24 months, case 2 is 36 months. These standards of service period are useful because 24 months is the present service period of the draft system, and 36 months is the service period of PDS. But, if the Military Defense implements a voluntary system, it seems that at least 3 years of service period will be set forth, because 2 years of service period is too short for them to show their ability. In addition, I will estimate the cost of a voluntary system and analyze the result by applying the alternative pay of the PDS

Case 1) The Criterion of 24 Month Military Service

With the criterion of 24 month military service, if the force strengths of the Army are 450K, 400K, 310K, and 240K, annual recruits will be the half of those force strengths: 225K, 200K, 155K, and 120K. If we apply those annual recruits to supply curve, available number of military manpower by each pay level are as follows.

Table 8: The Annual Supply of Recruits by Each Pay Level (24 Months)

Force strengths	450,000	400,000	310,000	240,000
9,600	20,398	20,398	20,398	20,398
10,800	17,481	17,481	17,481	17,481
12,000	20,926	20,926	20,926	20,926
Annual	13,200	28,336	28,336	28,336
Pay	14,400	30,523	30,523	30,523
	15,600	32,955	32,955	2,334
	16,800	27,045	27,045	4,379
	18,000	24,269	1,937	-
	19,200	22,114	-	-
	20,400	948	-	-
Annual recruits	225,000	200,000	155,000	120,000

In Table 8, with the criterion of 24 month military service, in case of annual recruits of

255,000, the Army needs draft-eligible men whose annual pay level is 20,400K won, and in case of annual recruits of 120,000 the Army needs draft-eligible men whose annual pay level is 15,600K won. That is, the number of draft-eligible men by each pay level is differed according to the recruit requirements.

On the basis of Table 8, the demand for the annual recruits can be displayed in supply curve like Figure 10.

Figure 10: The Demand for Annual Recruit in Supply Curve (24 Months)

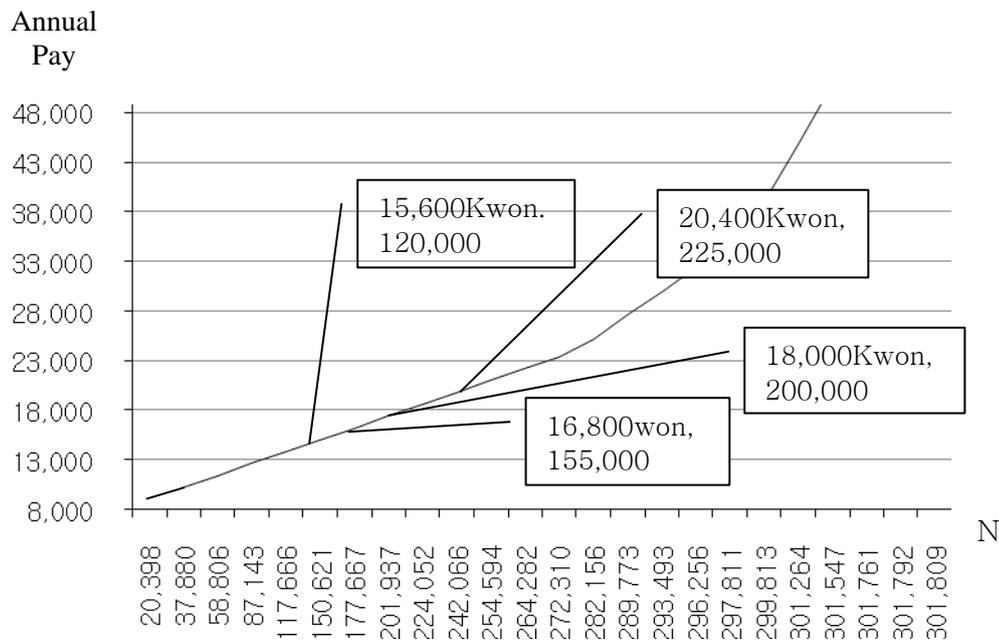


Figure 10 shows the pay level and the number of the military manpower by each pay level when the number of annual recruits are 225K, 200K, 155K, and 120K.

Consequently, depending on each the force strengths, if we multiply annual recruits by the corresponding annual pay we can estimate the annual economic cost of the voluntary system.

Table 9: The Economic Cost (24 Months)

Force strengths	Total cost ¹⁵	Annual recruits	Annual cost ¹⁶
450,000	6,597,222,864,000	225,000	3,298,611,432,000
400,000	5,639,573,376,000	200,000	2,819,786,688,000
310,000	4,073,981,568,000	155,000	2,036,990,784,000
240,000	2,971,466,664,000	120,000	1,485,733,332,000

Table 9 shows the total economic cost with the each force strengths in shifting to a voluntary system. If the Army moves to a voluntary system with the force strengths of 450,000 men, like the current state, the expected costs are roughly 6,500 billion won, on the other hand, if the Army reduces the force strengths of 240,000 men, the expected cost is 2,900 billion won.

We estimated the economic cost of draft system in earlier chapter 3, the cost amounted to the minimum 6,062 billion won and the maximum 8,132 billion won, thus the average cost was 7,090 billion won. On the other hand, the expected economic cost of the voluntary system is 6,500 billion won in keeping the same force strengths of 450 thousand. The economic cost of the voluntary system is smaller than the draft system as much as roughly 590 billion won, this difference is induced by the supply curve. That is because we use the pay level by educational attainment as individual the opportunity cost when we estimate the economic cost of draft system.

¹⁵ Total cost = annual cost * 2

¹⁶ See appendix 2

On the other hand, the financial (budgetary) cost is as follows, Table 10.

Table 10: The Financial Cost (24 Months)

Force strengths	Total cost¹⁷	Annual recruits	Annual cost¹⁸
450,000	9,180,031,416,000	225,000	4,590,015,708,000
400,000	7,200,008,640,000	200,000	3,600,004,320,000
310,000	5,208,015,456,000	155,000	2,604,007,728,000
240,000	3,744,009,048,000	120,000	1,872,004,524,000

When the Army recruits men, they must pay the same amount to the all recruits even if their civilian pay level is unequal to each other. So, depending on the each force strengths, the annual pay level the Army should be 20,400K, 18,000K, 16,800K, and 15,600K won, which are the last pay levels of the each force strengths. As a result, the expected financial cost is 9,100 billion won with the force strengths of 450,000 men, and 3,700 billion won with the force strengths of 240,000 men as shown in Table 10. The financial cost is higher than the economic cost of the same force strengths. But, the difference between economic cost and financial cost is the supplier surplus from a standpoint of the society, thus real cost of the voluntary system is the economic cost.

Case 2) The Criterion of 36 Month Military service

The method of estimating the cost of voluntary system with the criterion of 36 month military service is not different from the method with the criterion of 24 month military service. There is a difference only in the numbers applied by each pay level because the number of annual recruits needs to be decreased. So, the number of annual recruits requirements is 150K with the force strengths of 450K, 133K with the force strengths of 400K, 103K with force

¹⁷ Total cost = annual cost * 2

¹⁸ See appendix 3

strengths 310K, and 80K with the force strengths of 240K.

Table 11: The Annual Supply of Recruits by Each Pay Level (36 Months)

Force strengths	450,000	400,000	310,000	240,000
9,600	20,398	20,398	20,398	20,398
10,800	17,482	17,482	17,482	17,482
Annual pay 12,000	20,926	20,926	20,926	20,926
13,200	28,337	28,337	28,337	21,194
14,400	30,524	30,524	15,857	-
15,600	32,334	5,334	-	-
Annual recruits	225,000	200,000	155,000	120,000

Table 11 shows the supply¹⁹ of draft eligible men by each annual pay level depending on the annual number of recruits with the criterion of 36 month service period. As compared with the criterion of 24 months, we can know that the number of recruits with a relatively high annual pay level goes down. That is because that the annual number of recruits needed decreases with the criterion of 36. Especially, considering that there are many men with university degree in the of high pay level group, voluntary system with the criterion of 36 month has a merit that it doesn't need to enlist the high-quality human resource in the Army.

Now, the total economic cost is described as below in Table 12. It is calculated by multiplying the annual numbers of recruit of each pay level by each corresponding annual pay level on supply curve.

¹⁹ We assume that annual distribution of draft-eligible men by each pay level is same

Table 12: The Economic Cost (36 Months)

Force strengths	Total cost ²⁰	Annual recruits	Annual cost ²¹
450,000	5,861,199,996,000	150,000	1,953,733,332,000
400,000	4,597,599,996,000	123,000	1,532,533,332,000
310,000	3,714,373,836,000	103,000	1,238,124,612,000
240,000	2,746,492,200,000	80,000	915,497,400,000

In Table 12, if the Army keeps the force strengths of 450,000 men with the criterion of 36 month military service, the expected total economic cost is roughly 5,860 billion won, and with the force strengths of 240,000 men the expected cost is 2,740 billion won.

On the other hand, the financial cost with the criterion of 36 month military service can be estimated likewise the criterion of 24 months

Table 13: The Financial Cost (36 months)

Force strengths	Total cost ²²	Annual recruits	Annual cost ²³
450,000	7,020,013,572,000	150,000	2,340,004,524,000
400,000	5,756,413,572,000	123,000	1,918,804,524,000
310,000	4,449,588,768,000	103,000	1,483,196,256,000
240,000	3,167,993,268,000	80,000	1,055,997,756,000

In table 13, the total final cost is estimated at roughly 7,020 billion won with the force strengths of 450,000 men, and roughly 3,100 billion won with the force strengths of 240,000 men.

²⁰ Total cost = annual cost * 3

²¹ See appendix 4

²² Total cost = annual cost * 3

²³ See appendix

Case 3) the Criterion of Pay of the Paid-Draft System

The cost estimation with the criterion of 24 and 36 month military service is changed by the supply numbers of each pay level according to each force strengths. However, if we estimate the cost with the criterion of pay of PDS, it is changed only by the size of the force strengths irrespective of service period and the numbers of draft-eligible men by each pay level.

Before estimating the cost with criterion of pay of PDS, we need one assumption. That is the number of men with the higher pay level than a monthly pay of 1,200K won who can enlist in the Army.²⁴

Based on the above mentioned assumption, the estimated cost with the criterion of pay PDS is as follows, Table 14. At this point, the economic cost and financial cost of PDS are the same amounts because there is only one criterion of pay level, monthly 1,200K won.

Table 14: Total Cost with Criterion of Pay of PDS

Force Strengths	Total cost (billion won) ²⁵	Annual pay (thousand won)	Annual recruit (thousand)		Annual cost (billion won)	
			24	36	24	36
			Month	Month	Month	Month
450,000	6,480	14,400	225	150	3,240	2,160
400,000	5,776	14,400	200	123	2,888	1,771
310,000	4,464	14,400	155	103	2,232	1,483
240,000	3,456	14,400	120	80	1,728	1,152

By Table 14, the expected total cost is roughly 6,400 billion won with the force strengths of 450,000 men and roughly 3,400 billion won with the force strengths of 240,000 men.

²⁴ It is possible for them to enlist in the Army with their willingness and unemployment. The Military Manpower Administration don't open the data associated with competition rate, but the person concerned says that the Military Manpower Administration attains the objective strengths planned enough by now.

²⁵ Total cost = the force strengths*annual pay

4.3. The Analysis

So far, we have estimated the cost of the voluntary system by applying the criterion of service period and the criterion of pay of PDS depending on the respective force strengths. Firstly, let's examine how the voluntary system minimizes the social cost as compared with the draft system. Table 15 shows the status of surplus labor of the Military Defense with a voluntary system.

Table 15: The Status of Surplus Labor

Force Strengths (The Military Defense)	Annual Recruits		Available Labor	Surplus Labor	
	24 Months	36 Months		24 Months	36 Months
510,000	255,000	170,000	300,000	45,000	130,000
460,000	230,000	153,000	300,000	70,000	147,000
370,000	185,000	123,000	300,000	115,000	177,000
300,000	150,000	100,000	300,000	150,000	200,000

In South Korea's case, the allocative cost is not induced and only deadweight loss is induced because South Korea has the all-draft system. In Table 15, under the all-draft system, surplus labor should serve in reservist duty, not active duty. That means a misallocation of labor resource because men on reservist duty are not actually necessary in this peace time but they must serve in other sector for the equity of military duty under the all-draft system. So, deadweight loss is produced by misallocation of labor resource in the light of the society. However, under a voluntary system the surplus labor doesn't need to enlist in the military. So, the surplus labor remains in civil sector in order of the biggest civilian labor productivity. That means a voluntary system minimizes the deadweight loss by making surplus labor maximize their civilian labor productivity in civilian sector. Especially, the deadweight loss will decrease as the service period decrease more and more. Therefore, there is no room for argument that the voluntary system is better than the draft system with respect to economic

standpoint.

Secondly, the distribution of draft-eligible men by pay level and the service period are very important factors to estimate the economic cost and financial cost of the voluntary system. In general, the cost decreases when the force strengths reduce and the service period decreases.

Table 16: Comparison between the Economic and the Financial Cost

Force Strengths	24 Months		36 Months		Pay of PDS
	Economic cost (billion)	Financial cost (billion)	Economic cost (billion)	Financial cost (billion)	Economic & Financial cost (billion)
450,000	6,597.2	9,180.0	5,861.1	7,020.0	6,480.0
400,000	5,639.5	7,200.0	4,597.5	5,756.4	5,776.0
310,000	4,073.9	5,208.0	3,714.3	4,449.5	4,464.0
240,000	2,971.4	3,744.0	2,746.4	3,167.9	3,456.0

Table 16 shows the comparison between the economic cost and financial cost of voluntary system according to the each criterion. At first, if we compare the economic and financial cost of the criterion of 24 months with the economic and financial cost of the criterion of 36 months, we can find that the cost of the 36 months criterion is smaller than the cost of 24 months criterion with the same force strengths. That is because the number of draft-eligible men with relatively high pay level are not necessary as the annual recruit requirements reduce. Also, we can find that the difference between the financial cost of 24 months criterion and 36 months criterion is 2,100 billion with the force strengths of 450,000 men, while the difference with the force strengths of 240,000 men is 600 billion. This implies that it is impossible to attract large number of recruits without a big pay increase. That is, the slope of supply curve is gentle in the low pay level section, but is steep in the relatively high pay level section. One of the reasons we can presume is the characteristics of supply curve in South Korea. In supply of the draft-eligible men, the 25 percentage of men is graduates with high school

degree. On the other hand, the roughly 75 percentage of men are graduates with junior college and university degree. We got the supply curve from the cumulative numbers by each civilian pay level, not cumulative numbers by educational degrees. However, if we consider that there are many university graduates in high pay level, we can conjecture that it is difficult for the Army to secure the forces objectives without a big pay increase as the forces objectives increase.

Third, the cost of the voluntary system with criterion of the pay of PDS is the cheapest regarding over the force strengths of 400,000 men, but it is more costly regarding under the force strengths of 400,000 men. This is natural because the Army pays 1,200K won monthly to the men who have less than 1,200K won monthly. We can guess the reason why the Army pays to Paid-soldiers more money currently? Usually the pay level of PDS is higher than pay level of the normal combatant. That is why the Paid-soldiers are more skillful than normal combatants. Also, the estimated cost of the voluntary system with the pay of PDS is very useful in that the pay of PDS is applicable to the voluntary system right now depending on the success of PDS. The Army has a plan to increase the paid-soldier as much as 40,000 by 2020. So, we need to watch that plan with concern. That is, if the plan is not successful we can conjecture that the monthly pay to be increased is more 1,200K won monthly in regard to a voluntary system.

5. The prospects of Transition into a Voluntary system

So far, we examined how much economic and financial cost will be expensed with a voluntary system according to the each force strengths. Then, at present, is the transition into a voluntary system feasible? The reasons the government and the Ministry of National Defense provide against the implementation of the voluntary system are financial problems.

This is because, the budget required for the transition into the voluntary system is far greater than the government budget allocated for the military and also the Ministry of National Defense budget. Therefore, let us examine if financial issues are really the main reasons behind the reluctance to implement the voluntary system.

Table 17: The Status of Budget in 2006

	Personnel cost (trillion)	The Army (trillion)	The Defense (trillion)	The government (trillion)
Budget in 2006²⁶	56,902	100,039	225,129	1,448,000
Average increase rate^a	6.6%	8.8%	9.4%	8.0%

a. Average increase rate from '02 to '05, "Annual Report on the Army 2007."

In 2006, the government budget was 147 trillion won, the national defense budget was 22.5 trillion, and the Army budget was 10 trillion won. The personnel cost in the Army budget (including meals, clothes; 1.4 trillion won) was 5.7 trillion won. Now, if the Army moves to a voluntary system with the force strengths of 400,000men, even the minimum financial cost of 6.4 trillion, which is the cost applied to the criterion of pay of PDS, will be a big burden to Military Defense and the Army when the cost is compared with the defense budget of 2006 and personnel cost of the Army of that same year. The financial cost of 6.4 trillion is 28 percent of the defense budget, and exceeds the personnel cost of the Army budget. Also, the financial cost of 6.4 trillion is only for soldiers, not including officers. So, personnel cost including officers amounts to 12.1 trillion won, which will exceed the Army budget as well. Consequently, it seems impossible to move to a voluntary system at this point in time.

However, the budget issue is altogether a different problem from the national point of view. That is because a budget occupies only a small portion of national productivity. As mentioned

²⁶ See appendix 6

before, the greatest issue with the draft system is the deadweight loss. Since the demand curve for the military manpower is not known, it is not feasible to estimate the size of the deadweight loss, however, as can be seen from the status of surplus labor in Table 15, the size of the deadweight loss resulted by the draft system would be very significant.

Therefore, since it is quite possible to maximize the national productivity by transitioning into the voluntary system, getting rid of the deadweight loss, the financial reasons cited by the government and the Ministry of National Defense for not transitioning into the voluntary system are wrong from an economic point of view. For example, the 7.1 trillion won of financial cost may occupy a large portion of the defense budget, but from a national point of view, the national productivity lost due to the draft system is much more important. Therefore, the argument that supports the draft system due to financial reasons is not proper.

If there is any problem at all associated with the transition into the voluntary system, it might be with the public opinion. If people feel that threats to national security have increased due to the transition into the voluntary system, no matter how much the national productivity is increased, the implementation of the voluntary system will not be feasible. According to the national security consensus conducted by the Research Institute on National Security Affairs of the Korea National Defense University in 2006, only 29.5% of the population is in favor of the implementation of the voluntary system. This wide-spread public opinion shows that it is too early for the implementation of the voluntary system. It has been stated before that the military service system is determined by many variables other than the economic variable, public opinion is one of those important variables.

Also, the transition into the voluntary system is a political issue and it clearly implies a tax

increase for the people. It is only natural that the taxpayer does not welcome a voluntary system in which they have to pay more taxes than what they are paying now. Of course, from a standpoint of men having military duty, the transition to a voluntary system might be good to them but from a standpoint of men discharged military duty, voluntary system impose another tax on them. The problem is that the number of men discharged from military duty is significantly more than the number of draftable men. Because of this, the politicians, who need significant support from the population, will be quite reluctant to adopt the voluntary system.

In South Korea, it is quite likely that the implementation of the voluntary system will not be realized for reasons other than those cited above. However, considering the fact that the voluntary system maximizes the national productivity, it is an issue that needs to be seriously reviewed by the concerned departments of the government, Ministry of National Defense etc.

6. Summary and Conclusion

So far, many preceding studies have suggested that the voluntary system is better than the draft system from the standpoint of efficiency because the draft system induces the additional allocative cost. That is, in the process of compulsory draft, civilian labor productivity is not maximized due to the random selections without considering the individual opportunity cost. However, that is suitable for the U.S. with the selective draft system, while that is not applicable to South Korea with the all-draft system. Since all qualified men should enlist in the military under the all-draft system, the allocative cost by random selections are not produced. Thus, I stated about the deadweight loss as basic social cost. The deadweight loss is social cost produced by misallocation of labor resource between military sector and civilian sector. In other words, that is the fundamental problem on how the labor resources are

allocated to the military sector and civilian sector to maximize the civilian output. In brief, the total social cost of the draft system will be the sum of the allocative cost and deadweight loss. Many preceding studies have focused on the allocative cost, but we need to know about deadweight loss regarding to the draft system. Especially, since South Korea has all-draft system, he should care about this deadweight loss.

Also, the draft system produces the equity of tax burden by imposing the implicit income tax (economic cost minus financial cost) on the draftees. The civilians can use the defense service with small explicit tax under the draft system, but that is just unreasonable tax burden to the draftees. So, the draft system can't be free from the problem of equity of tax burden, especially as the society develops economically. Actually, if we estimate the cost of the draft system in South Korea, the financial cost is roughly 1,235 billion won, and the economic cost is minimum 6,062 billion won and maximum 8,132 billion won. So, the draft system spends maximum 6,897 billion won and minimum 4,827 billion won annually as the invisible cost to keep the draft system. In other words, the draftees have paid this cost as the implicit tax.

We estimated how much cost would be spent if the draft system moves to a voluntary system. We assumed that the demand for military manpower is given by the Military Reform 2020, and we use the cumulative numbers (distribution) of draft-eligible men by each pay level as the supply curve. We estimated the cost of a voluntary system depending on service period. One is the criterion of 24 month military service and the other is the criterion of 36 month military service. In addition, we estimated the cost with the criterion of pay of PDS. As a result, if the Army keeps the force strengths of 450,000 men as of 2006 under the voluntary system, roughly 9,700 billion is estimated with 24 months criterion and 7,000 billion is estimated with 36 months criterion as financial costs, respectively. Also, we estimate the cost

of a voluntary system with the criterion of pay of PDS for the each force strengths. That is meaningful in that the pay of PDS is an applicable pay level to voluntary system immediately.

If we compare these financial costs with the present Army budget of 5,600 billion won, it exceeds the Army budget. So, it seems impossible to move to a voluntary system at this point in time. However, the budget issue is a totally different one altogether from the national point of view. Budget is only a small portion of the national GDP. Namely, for the country, the deadweight loss incurred due to the draft system may be much more in terms of national productivity. Therefore, if the transition into a voluntary system can reduce the deadweight loss resulted due to the draft system, it is better to adopt the voluntary system right away.

Hence, in regards to the transition into the voluntary system, budget is not a major issue. On the other hand, factors such as public opinion about the voluntary system and political issues other than economic may hamper the transition into the voluntary system. This truly points out the fact that the transition into a voluntary system may not be well received by the population from a political point of view. However, considering the fact that the voluntary system is better than the draft system in terms of economy, the adoption of the voluntary system deserves a serious review by all concerned authorities.

So far, we examined the theoretical background of draft system to estimate the cost of the draft system, and we actually estimated the economic cost and financial cost of the draft in South Korea. Also, we examined the prospect of the transition to a voluntary system by estimating the economic and financial cost with the each force strengths.

However, there were many restrictions for study as well. Above cost estimation was possible

under the assumption that the demand for the military manpower was given by the Army. Actually, it is necessary to measure the social cost to estimate the cost of the draft system. To do so, the demand curve for military manpower is essential but there are no studies relevant to the demand curve in South Korea. That is because the demand for military manpower must reflect such extra-economic variables as national security risk, historical experience, national sentiment, and so forth.

On supply side, we use the cumulative distribution of the draftable men born in specific year according to the pay level under the assumption that the distribution of draftable men follows the distribution of men aged 19 to 24 by civilian pay level. However, there may be some problems because in the present South Korea most of the above mentioned men aged 19 to 24 are students and servicemen in the military, so there may be some errors in the sample. In addition to that, the supply curve can be affected by manifold variables such as unemployment, the degree of individual aversion to the military, and so forth. Therefore, further studies about the supply and demand for military manpower are necessary to move to a voluntary system in South Korea.

APPENDICES

- 1. Pay level by Education, Age, and workers by size**
- 2. The Economic Cost with the Criterion 24 Month military service**
- 3. The Financial Cost with the Criterion 24 Month military service**
- 4. The Economic Cost with the Criterion 36 Month military service**
- 5. The Financial Cost with the Criterion 36 Month military service**
- 6. The Status of Budget in 2006**

[Appendix 1] Pay level by Education, Age, and workers by size

Size	Education	Age	2005				
			Mean average (age)	Years of continuous employment (year)	Monthly payment (won)	Regular payment (won)	Overtime payment (won)
Group 1 (5 ~ 9 persons)	High school	~ 19 years old	18.3	0.6	859,012	794,224	64,788
		20 ~ 24	22.8	0.9	1,134,795	1,086,160	48,635
	College and university over	20 ~ 24	23.5	1	1,123,877	1,072,139	51,738
Group 2 (10 ~ 29 persons)	High school	~ 19 years old	18.7	0.7	954,659	871,337	83,322
		20 ~ 24	22.6	1.2	1,159,026	1,008,186	150,840
	College and university over	~ 19 years old	-	-	-	-	-
Group 3 (30 ~ 99 persons)	High school	20 ~ 24	22.9	0.9	1,331,224	1,261,994	69,230
		~ 19 years old	18.5	0.7	1,026,164	785,648	240,516
	Junior college	20 ~ 24	22.5	1.4	1,160,906	907,833	253,073
		~ 19 years old	18.9	0.9	938,496	843,636	94,860
		20 ~ 24	23.1	0.9	1,197,437	1,054,128	143,310
	College and university over	~ 19 years old	19	0.5	818,778	803,000	15,778
		20 ~ 24	23.1	0.9	1,264,628	1,181,358	83,270
		25 ~ 29	27.5	1.6	1,652,969	1,573,354	79,615
		~ 19 years old	18.5	0.8	1,131,301	848,494	282,807
Group 4 (100 ~ 299 persons)	High school	20 ~ 24	22.6	1.4	1,243,622	942,319	301,304
		~ 19 years old	18.7	0.7	896,847	810,111	86,736
	Junior college	20 ~ 24	23.2	1	1,313,389	1,104,602	208,787
		~ 19 years old	19	0.8	1,222,889	1,086,296	136,593
	College and university over	20 ~ 24	22.9	1.1	1,348,382	1,246,162	102,220

[Appendix 1]- (continued)

Size	Education	Age	2005				
			Mean average (age)	Years of continuous employment (year)	Monthly payment (won)	Regular payment (won)	Overtime payment (won)
Group 5 (300 ~ 499 persons)	High school	~ 19 years old	18.2	0.8	1,299,920	770,070	529,850
		20 ~ 24	22.9	1.3	1,246,220	875,435	370,785
	Junior college	~ 19 years old	18.9	0.4	959,900	639,100	320,800
		20 ~ 24	23.1	0.9	1,272,629	978,347	294,281
Group 6 (500 persons over)	College and university over	~ 19 years old	19	0.6	601,273	601,273	0
		20 ~ 24	23.1	1.2	1,381,262	1,215,671	165,592
	High school	~ 19 years old	18.5	0.9	1,232,292	976,320	255,972
		20 ~ 24	22.9	2	1,312,131	1,002,344	309,788
	Junior college	~ 19 years old	18.6	0.7	1,149,238	864,119	285,119
		20 ~ 24	23.4	1	1,280,246	1,090,262	189,984
	College and university over	~ 19 years old	19	0.2	903,828	616,586	287,241
		20 ~ 24	23.4	0.9	1,560,316	1,429,811	130,505

[Appendix 2] The Economic Cost with the Criterion 24 Month military service

Annual payment	Number	Cost	Number	Cost	Number	Cost	Number	Cost
9,600,000	20,398	195,822,144,000	20,398	195,822,144,000	20,398	195,822,144,000	20398	195,822,144,000
10,800,000	17,482	188,800,416,000	17,482	188,800,416,000	17,482	188,800,416,000	17482	188,800,416,000
12,000,000	20,926	251,114,040,000	20,926	251,114,040,000	20,926	251,114,040,000	20926	251,114,040,000
13,200,000	28,337	374,047,212,000	28,337	374,047,212,000	28,337	374,047,212,000	28337	374,047,212,000
14,400,000	30,524	439,539,120,000	30,524	439,539,120,000	30,524	439,539,120,000	30524	439,539,120,000
15,600,000	32,955	514,100,652,000	32,955	514,100,652,000	32,955	514,100,652,000	2334	36,410,400,000
16,800,000	27,046	454,369,104,000	27,046	454,369,104,000	4,379	73,567,200,000	-	-
18,000,000	24,270	436,857,480,000	22,333	401,994,000,000	-	-	-	-
19,200,000	22,115	424,601,664,000	-	-	-	-	-	-
20,400,000	948	19,339,200,000	-	-	-	-	-	-
Annual recruits	225,000	3,298,591,032,000	200,000	2,819,786,688,000	155,000	2,036,990,784,000	120,000	1,485,733,332,000
Force Strength	450,000	6,597,182,064,000	400,000	5,639,573,376,000	310,000	4,073,981,568,000	240,000	2,971,466,664,000

[Appendix 3] The Financial Cost with the Criterion 24 Month military service

Annual payment	Number	Cost	Number	Cost	Number	Cost	Number	Cost
9,600,000	20,398	416,122,056,000	20,398	367,166,520,000	20,398	342,688,752,000	20,398	318,210,984,000
10,800,000	17,482	356,623,008,000	17,482	314,667,360,000	17,482	293,689,536,000	17,482	272,711,712,000
12,000,000	20,926	426,893,868,000	20,926	376,671,060,000	20,926	351,559,656,000	20,926	326,448,252,000
13,200,000	28,337	578,072,964,000	28,337	510,064,380,000	28,337	476,060,088,000	28,337	442,055,796,000
14,400,000	30,524	622,680,420,000	30,524	549,423,900,000	30,524	512,795,640,000	30,524	476,167,380,000
15,600,000	32,955	672,285,468,000	32,955	593,193,060,000	32,955	553,646,856,000	2,334	36,410,400,000
16,800,000	27,046	551,733,912,000	27,046	486,824,040,000	4,379	73,567,200,000	-	-
18,000,000	24,270	495,105,144,000	22,333	401,994,000,000	-	-	-	-
19,200,000	22,115	451,139,268,000	-	-	-	-	-	-
20,400,000	949	19,359,600,000	-	-	-	-	-	-
Annual recruits	225,000	4,590,015,708,000	200,000	3,600,004,320,000	155,000	2,604,007,728,000	120000	1,872,004,524,000
Force Strength	450,000	9,180,031,416,000	400,000	7,200,008,640,000	310,000	5,208,015,456,000	240000	3,744,009,048,000

[Appendix 4] The Economic Cost with the Criterion 36 Month military service

Annual payment	Number	Cost	Number	Cost	Number	Cost	Number	Cost
9,600,000	20,398	195,822,144,000	20,398	195,822,144,000	20,398	195,822,144,000	20,398	195,822,144,000
10,800,000	17,482	188,800,416,000	17,482	188,800,416,000	17,482	188,800,416,000	17,482	188,800,416,000
12,000,000	20,926	251,114,040,000	20,926	251,114,040,000	20,926	251,114,040,000	20,926	251,114,040,000
13,200,000	28,337	374,047,212,000	28,337	374,047,212,000	28,337	374,047,212,000	21,194	279,760,800,000
14,400,000	30,524	439,539,120,000	30,524	439,539,120,000	15,857	228,340,800,000	-	-
15,600,000	32,334	504,410,400,000	5,334	83,210,400,000	-	-	-	-
Annual recruits	150,000	1,953,733,332,000	123,000	1,532,533,332,000	103,000	1,238,124,612,000	80,000	915,497,400,000
Force Strength	450,000	5,861,199,996,000	400,000	4,597,599,996,000	310,000	3,714,373,836,000	240,000	2,746,492,200,000

[Appendix 5] The Financial Cost with the Criterion 36 Month military service

Annual payment	Number	Cost	Number	Cost	Number	Cost	Number	Cost
9,600,000	20,398	318,210,984,000	20,398	318,210,984,000	20,398	293,733,216,000	20,398	269,255,448,000
10,800,000	17,482	272,711,712,000	17,482	272,711,712,000	17,482	251,733,888,000	17,482	230,756,064,000
12,000,000	20,926	326,448,252,000	20,926	326,448,252,000	20,926	301,336,848,000	20,926	276,225,444,000
13,200,000	28,337	442,055,796,000	28,337	442,055,796,000	28,337	408,051,504,000	21,194	279,760,800,000
14,400,000	30,524	476,167,380,000	30,524	476,167,380,000	15,857	228,340,800,000	-	-
15,600,000	32,334	504,410,400,000	5,334	83,210,400,000	-	-	-	-
Annual recruits	150,000	2,340,004,524,000	123,000	1,918,804,524,000	103,000	1,483,196,256,000	80,000	1,055,997,756,000
Force Strength	450,000	7,020,013,572,000	400,000	5,756,413,572,000	310,000	4,449,588,768,000	240,000	3,167,993,268,000

[Appendix 6] The Status of Budget in 2006

Unit: Billion

Year	02	03	04	05	06	Average
Government Budget	109,630.0	111,418.0	118,300.0	134,370.0	144,700.0	127,303.6
%(Increase rate compared with previous year)		1.6	6.2	13.6	7.8	8
Defense Budget	16,364.0	17,514.8	18,941.2	20,822.6	22,512.9	19,231.1
%(Increase rate compared with previous year)		7	8.1	9.9	8.1	9.4
Army Budget	7,397.0	7,982.6	8,620.4	9,170.2	10,003.9	8,634.8
%(Increase rate compared with previous year)		7.9	8	6.4	9.1	8.8
Defense Capacity Improvement Cost	1,866.0	1,950.5	2,041.0	2,253.5	1,817.0	1,985.6
%(Increase rate compared with previous year)		4.5	4.6	10.4	-19.4	-0.7
Ordinary Operating Cost	5,531.0	6,032.1	6,579.4	6,916.7	8,186.9	6,649.2
%(Increase rate compared with previous year)		9.1	9.1	5.1	18.4	12
Personnel Cost	4,499.9	4,829.1	5,113.6	5,299.7	5,690.2	5,086.5
%(Increase rate compared with previous year)		7.3	5.9	3.6	7.4	6.6
Unit Activity	245.6	252.3	252.5	26.2	227.3	247.9
%(Increase rate compared with previous year)		2.7	0.1	3.8	-13.2	-1.9
Education and Training	129.3	137.6	139.2	130.4	132.8	133.9
%(Increase rate compared with previous year)		6.4	1.2	-6.3	1.8	0.7
Equipment Management	193.5	224.2	228.9	237.9	1,051.1	387.1
%(Increase rate compared with previous year)		15.9	2.1	3.9	341.8	110.8
Material Procurement	94.6	96.1	106.6	106.6	62.3	93.2
%(Increase rate compared with previous year)		1.6	10.9	0	-41.6	-8.5
Facility Construction	293.7	412.5	656.7	790.2	939.0	618.4
%(Increase rate compared with previous year)		40.5	59.2	20.3	18.8	54.9
Reserve Forces	74.4	80.3	81.9	89.9	84.1	82.1
%(Increase rate compared with previous year)		7.9	2	9.8	-6.5	3.3

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