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An Empirical Simulation for the Relevance of Alternative Systems to Unemployment Insurance in Korea*

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Using the simulated data set which is based upon the data set merging Economically Active Population Survey(EAPS) and the Supplementary Survey (SS) in 1998-2001, this paper examines the relevance of alternative programs Unemployment Insurance Savings Account (UISA) and Pension-funded Unemployment Benefit (PUB) - to unemployment insurance system in Korea. Estimating the relative size of unemployment benefit and IA balance under a specific type of UISA or PUB by simulation, this paper yields the two main results. First, replacing UI by UISA with the same benefit being maintained would be beneficial in terms of search efficiency in general, although its effectiveness is a little doubtful as for the non-regular workers. Second, the PUB is better than UISA as an alternative to UI, and also works relatively well even for the non-regular workers.

— Key Words : Unemployment Insurance Savings Account (UISA), Pension-funded Unemployment Benefit (PUB), Unemployment Insurance (UI)

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Ⅰ. Background for The Empirical Simulation

1. Alternative Systems to UI

One of the income support programs for the unemployed in Korea is unemployment insurance (or Employment Insurance as officially named in Korea), which started in 1995. The overall evaluation of the UI performance in Korea is rather negative, however. Although it was expected to play an active role as a social safety net during the economic crisis, it failed to meet the expectation, especially in terms of the coverage ratio. The government has tried to enhance the effectiveness of UI by loosening the entitlement conditions for UI since the crisis, but its performance is still in short of what is expected.

There are several reasons for the non-effectiveness of UI in Korea. One of them, as is the case in any other country adopting UI, is the adverse search incentive on the part of UI beneficiary. The incentive concern forced the Korean government to offer only the limited level of benefit for the unemployed, in which many workers did not show much interest. Second, most of the workers in the informal sector such as temporary and daily workers, who constitute about half of the wage workers in Korea, are not much motivated to get insured for a variety of reasons.[1)]

Taking into account incentive problems of UI in Korea in particular, we will consider a couple of alternative systems to UI. Following the idea suggested by

1) The ratio of UI beneficiaries to total unemployed wage-workers was as low as 20% in 2002, although it has been increasing in recent years. With the daily workers excluded, the ratio increases up to 30% in the same year, implying that the daily workers are relatively less likely to be insured by the system. Among the involuntarily unemployed workers, the ratio of beneficiaries jumps to 50% in 2002, indicating that the eligibility requirement of UI system that excludes voluntary quitters from UI benefit keeps the ratio low. See Hur (2000) Hur and Shim(1999).

Feldstein and Altman (1998) and the conceptual framework proposed by Stiglitz and Yun (2002), this paper aims to examine empirically the relevance of Unemployment Insurance Savings Account (UISA) and Pension-funded Unemployment Benefit (PUB)[2] in the context of Korea, respectively.

UISA or PUB basically finances unemployment benefit for an individual by the contribution he makes until retirement. As a contribution, a system may either require an individual to make separate savings against unemployment (as in UISA) or use an existing savings set aside for retirement (as in PUB). In the case of UISA, any remaining savings at the time of retirement will add to one's retirement income. On the contrary, if the total unemployment benefit he receives turns out to be greater than his total contribution he makes (UISA) or than his retirement income (PUB), it will be bailed out by the government.

As Stiglitz and Yun (2002) analyzed, the welfare advantage we can expect from these alternative systems depend upon several factors. First, to the extent that unemployment benefit for an individual is financed by his own income, it will definitely enhance his search incentive during unemployment compared to UI. This is the main reason why these alternative systems are considered. The incentive effect of an alternative system will thus become larger as the probability that the total unemployment benefit for an individual is smaller than the total contribution he makes gets higher.

Second, the alternative systems allow individuals to reduce the burden of unemployment risk through consumption-smoothing over lifetime. As one's unemployment benefit is financed by his savings or retirement income, an individual will become subject to the income (or consumption) fluctuation caused by unemployment risk, which is burdensome for a risk-averse worker. An important

2) Stiglitz and Yun (2002) introduce what we call the integrated UI, which integrates UI with retirement insurance. Note that PUB is different from integrated UI in that the latter uses UI as well as one's retirement income in financing one's unemployment benefit. But both PUB and the integrated UI shares in common the critical property that unemployment benefit of an individual is financed by his retirement income, which is the critical part of each of the two systems.

point, however, is that it is one's retirement income which fluctuates under UISA or PUB. That is, UISA or PUB allows an individual to smooth out his consumption profile over lifetime through savings and borrowings.[3] The income fluctuation caused by unemployment can then be spread out over one's lifetime, making the risk burden of unemployment small. In this respect the consumption-smoothing effect (or the effect of reduction in risk-burden) would become greater as the total unemployment benefit is smaller relative to one's lifetime income.

Third, the sustainability of the system is also critical for its effectiveness. The amount of unemployment benefit an unemployed individual gets may be temporally larger especially in his young ages than the amount of contribution he has accumulated, although the difference may be repaid later in the future. In the meantime, however, an individual may have adverse incentive to exit the system after getting a great amount of unemployment benefit in excess of his contribution, making the system unsustainable. The sustainability of a system becomes lower, therefore, as the difference between the accumulated unemployment benefit and the accumulated contribution remains to be large over the wider range of ages for many individuals.

The above arguments suggest that the welfare performance of an alternative system is closely related to (i) the relative size of unemployment benefit for an individual compared to one's lifetime income and to (ii) the difference between the accumulated unemployment benefit and the accumulated contribution at each age up to the retirement. To deal with the second variable more effectively, we will consider a hypothetical individual account (IA) for an individual, to which he contributes a certain portion of his income just for unemployment (UISA) or for retirement (PUB) and from which he withdraws a certain amount upon unemployment. The balance of IA at each age for an individual represents the difference between the total unemployment benefit he has received and the total contribution he has made up to that time. Both of the two systems we study allow

3) Note that, in the case of UISA, the remaining savings of an individual at the time of retirement adds to his retirement income.

for negative balance in one's IA, i.e., for withdrawing more than the remaining balance in one's IA. When an individual ends up with negative balance at the time of retirement, it will be bailed out by the government. What is particularly important is the sign of the IA balance before and at the time of one's retirement, which determines incentive efficiency and sustainability of an alternative system.

2. UISA vs. PUB

Although the IA balance of an individual is critical for the effectiveness of UISA or PUB, it clearly depends upon the contribution rate adopted by the system. As the contribution rate gets higher, the possibility that an individual experiences negative IA balance would become lower, enhancing the incentive efficiency and sustainability of the system. On the other hand, however, high contribution rate may distort consumption decision of an individual and may expose more of an individual income to unemployment risk. In determining a contribution rate for a system, therefore, we are faced with a trade-off between consumption distortion and risk burden on the one hand and need for positive IA balance on the other.

This trade-off will be much less serious for PUB than for UISA, however, because individual contribution mandated by PUB has to be made for one's retirement anyway. To the extent that UISA mandates an individual to make another savings on top of the mandatory retirement savings, the cost of contribution under UISA would be higher than that under PUB. It would thus be difficult for UISA to set high contribution rate, given that the rate of retirement savings is already set to be high.

There are a few types of savings that people in Korea can make for their retirement consumption. First, there is a public mandatory retirement program under which each of an individual and his employer contributes 4.5% of his wage income. For each individual, therefore, 9% of his income is contributed to the public mandatory retirement program. Anticipating serious budgetary problem of the program, the Korean government plans to increase the contribution rate gradually

over the next several years. Second, there is a mandatory program for retirement allowance, to which an employer is required to contribute about 8.3% of a worker's income. Under this program a worker is entitled for a certain amount of severance benefit (depending upon his tenure and recent wage) when separated. Although this program is mandatory, all the workers in the informal sector are currently excluded from the benefit. Third, an individual can make his own savings for retirement, which is tax-exempt. Finally, in addition to these, an individual often makes investments in real estate for his retirement purpose in Korea. Considering these mandatory programs and private options, we can safely argue that people put at least 10 % of their income aside for their retirement.

Given the sizable rate of mandatory retirement savings in Korea, the chance that an individual experiences negative IA balance under PUB, i.e., that the lifetime unemployment benefit is greater than his retirement benefit, would be almost zero, as will be shown later in this paper. Under this circumstance there would be no reason why additional savings against unemployment only needs to be introduced. In other words, PUB is a better alternative to UI than UISA. In particular, to the extent that the contribution rate of PUB is higher than that of UISA, PUB would be able to provide the unemployed with relatively large amount of unemployment benefit without weakening their search incentives and the sustainability of the system.

One might say, however, that it would not be desirable to expose the whole amount of one's retirement income to unemployment risk. If the resulting risk burden is serious, PUB may then set a restriction on the maximum amount of unemployment benefit that can be financed by retirement income to alleviate the risk burden. But as we will see later, total amount of unemployment benefit for an individual is so small relative to his retirement income in reality that the risk burden may in fact become small due to consumption smoothing over the lifetime. Thus, we will consider in this study a PUB that does not set any limit to the amount of unemployment benefit financed by retirement income.

As we are mainly concerned with the effectiveness of an alternative system in the

context of Korea, we will simulate in this paper a specific type of UISA or PUB to estimate the relative size of unemployment benefit and the sign of IA balance at each age up to the retirement. Based upon these estimates we will make the two arguments in this paper. First, replacing the current UI by UISA may be beneficial in Korea at least for regular workers in the formal sector and for the well-educated workers. Second, as an alternative to UI, PUB is better than UISA and it also works well for the non-regular workers as well as for regular workers.

Before getting into the detailed simulation analysis, we will briefly outline the overall economic trends of Korea in recent years in Section II. Section III describes the basic data sets EAPS (Economically Active Population Survey) and SS (the Supplementary Survey) and explains how a panel data set spanning the lifetime history of wage and employment status for an individual is simulated. The estimation strategies based on the simulated data set and the results will be presented in Section IV and V, which are followed by the concluding remarks in Section VI.

Ⅱ. Overview of Korean Economy

Until the recent financial crisis in late 1997, the Korean economy had accomplished a remarkable performance. After having experienced high annual growth rate of about 10% during sixties, seventies and eighties, the Korean economy has slowed down a little bit but still has performed well relative to other advanced countries. As Table 1 shows, the annual average real growth rate was approximately 7% for the 1990-96 period. Note also that the rapid economic growth was not accompanied by a high inflation rate during the nineties except in 1991, partly due to the government stabilization policies.

The economic crisis in late 1997, however, drastically changed macroeconomic conditions in the following years. In 1998 the real GDP growth rate was below

Table 1. Economic Growth and Inflation Rates in Korea

	1990	1993	1995	1996	1997	1998	1999	2000	2001
Growth Rate(%)	9.0	5.5	8.9	6.8	5.0	-6.7	10.9	9.3	3.0
Inflation Rate(%)	8.6	4.8	4.5	4.9	4.4	7.5	0.8	2.3	4.1

Source : Bank of Korea.

5%, and the inflation rate was over 7%. Although the economy rebounded in 1999 and 2000 by growing at the annual rate of 9-10%, the crisis has exerted profound impacts upon the Korean economy. In particular, the pattern of growth has changed. Prior to the crisis, the economy depended upon the extensive use of inputs such as labor and capital to achieve the rapid economic growth. But now the economy tends to focus on productivity increase or cost reduction for its development. As a result the annual rate of economic growth has been reduced to 3-5% since 2001, and it is also expected to remain at that level in the future.

The financial crisis, the subsequent structural reforms and macro economic stabilization programs undoubtedly affected the labor market. As Table 2 shows, the unemployment rate, which had been maintained to be 2-3% prior to the crisis, rose swiftly to 6.8% in 1998 and 6.3% in 1999. In particular, the unemployment rate surged up to 8.4% in the first quarter of 1999 with the number of the unemployed exceeding 1.7 million.

It is widely believed that the official unemployment rates may underestimate the seriousness of unemployment problem caused by the crisis. Given the difficulty of

Table 2. Recent Trends of Labor Market in Korea

	1995	1996	1997	1998	1999	2000	2001
Unemployment Rate (%)	2.0	2.0	2.6	6.8	6.3	4.1	3.7
College and Over	2.7	2.6	3.0	5.7	5.3	3.9	3.7
High School	2.5	2.5	3.3	8.2	7.6	4.7	4.3
Mid. School and Lower	1.6	1.6	2.2	7.8	6.9	4.3	3.8
Labor Force Participation	61.9	62.0	62.2	60.7	60.5	60.7	60.8
College and Over	80.6	80.8	81.5	78.8	77.4	77.0	77.3
High School	66.5	66.6	67.1	64.7	64.5	64.5	64.5
Mid. School and Lower	49.4	49.0	48.9	46.6	47.1	48.1	48.2

Sources: Korea National Statistical Office, *Korea Statistical Yearbook.*

getting jobs a considerable number of workers, female workers in particular, became discouraged and thus remove themselves from the labor force. The labor force participation rate, which had been monotonically increasing over time and finally reached 62.2% in 1997, sharply decreased to 60.7% in 1998, and decreased further to 58.6% in the first quarter of 1999. This sharp reduction in the labor force participation rate is mainly attributed to the huge exodus of women from the labor force. As Table 2 shows the labor force participation rate has been kept around 60% since then.

The crisis also affected the pattern of employment: the proportion of permanent workers out of total workers continues to decrease, while the proportion of temporary workers continues to increase. This fact reveals that the Korean labor market is experiencing a strong mobility.

The financial crisis affected the pattern of unemployment among different education groups. Before the crisis the unemployment rate had been higher for college and over' than for high school and under', although the difference is not sizeable. After the crisis, however, the trend has been reversed as in Table 2, which shows that the unemployment rate for high school and under' became higher than that for college and over'. The unemployment rate for the former group increased up to 9.1% in the first quarter of 1999, while that for latter group was 6.3% in the period. There are two reasons for this. First, the demand for college graduates has recently been increasing relative to the demand for high school graduates, mainly due to the recent IT boom. Second, more importantly, the recent structural adjustment process resulted in the significant downward mobility of workers, that is, many less educated workers were forced to leave their jobs in favor of more educated workers and remained unemployed.

Ⅲ. Data

The data set used in this study is based upon Economically Active Population Survey (EAPS) and its Supplementary Survey (SS). The data set EAPS, a monthly survey administered by Korea Statistical Office, spans 30,000 households aged 15 years old and over. A given sample continues to be used for four years. Since it started in 1963, it has replaced one sample by a new one in every four years. Thus, it is basically an accumulation of 4-year panel data sets. The survey EAPS asks respondents about their individual characteristics such as gender, age, schooling, marital status and about their work histories, job characteristics, and their search activities during unemployment. We use EAPS done from January, 1998 to December, 2001.

One major problem with EAPS is that it does not contain any information about individual income. Thus the government has recently administered another survey supplementary to EAPS, called Supplementary Survey (SS), once a year since 1998, which includes wage information for the respondents. Thus we will use SS done in September/1998, June/1999, August/2000, and August/2001, each of which corresponds to EAPS 1998-2001, respectively. We construct what we call the original data set by merging EAPS with SS on the basis of individual household ID, his/her gender and birth date.

Since each of 30,000 observations is not free from defects, some defected ones had to be discarded. First, out of the 30,000 observations in EAPS only the individuals who completed their schooling and continued responding to the survey in each month during the four years 1998-2001 are selected in the new data set. This selection procedure yields 22,182 observations. Out of 22,182 individuals, those who did not state their incomes or those who were out of labor force for more than 2 years are excluded. Finally only the individuals aged 21-60 are taken from the

remaining sample, leading to the final sample sized 12,572. Thus, the data set used in this paper is a four-year panel data of the sample size 12,572.[4]

The basic statistics for this data set is presented in Table 3. For the purpose of this study we also categorize workers by worker status into regular and non-regular (temporary and daily) workers. Presuming that it is not common for an individual to change his worker status frequently, we categorize in this study the sampled workers by their worker status in a specific year, 2001. The resulting distribution of workers by worker status is shown in Table 3.

1. Sample Expansion

The simulation study we would like to do in this paper requires us to have a complete lifetime history of employment and wage for an individual worker. Since the data set is a four-year panel, however, we need to simulate for each individual a set of wages and employment status for the years which are not specified by the data set.

In this paper we adopt a simple way of simulation for the unspecified wages and employment status of an individual. First, we divide the sample into 6 groups by gender (male, female) and education (middle school and lower, high school, college and over). Then, for a given group i (=1,.....,6), a frequency distribution Dti of employment status — employment, unemployment and non-labor force — is generated for each age t. Suppose that we have an individual in group i for whom the data set specifies his employment status at the age T, T+1, T+2, T+3. We then randomly sample employment status at each of his age except T, T+1, T+2, T+3 from the frequency distribution Dti of employment status for group i. This is how we get a lifetime history of employment status for an individual.[5]

4) Thus, the final sample includes self-employed workers as well as wage workers. The reason for this inclusion is because the alternative systems examined in the paper are supposed to cover self-employed workers as well as wage workers.

5) This simulation method for the unspecified employment status of an individual is similar to the one adopted by Foster (1999).

Table 3. Sample Statistics

		Original Data Set	Simulated Data Set
Mean Age (in 1998)		42.44	
Mean Schooling Years		10.62	
Mean Income (monthly)		107.01(128.76)	108.03(105.70)
Duration of Employment Status(month)**	Employment Duration	10.11(3.40)	9.77(1.00)
	Unemployment Duration	0.50(1.59)	0.49(0.32)
	Out-of-Labor Force	1.39(2.98)	1.74(1.11)
Sample Size by Group***	Group1	2,609(20.8%)	
	Group2	3,251(25.9%)	
	Group3	1,591(12.1%)	
	Group4	2,679(21.3%)	
	Group5	1,799(14.3%)	
	Group6	643(5.1%)	
Sample Size by Worker Status	Regular	3,509(27.9%)	
	Temporary	2,296(18.3%)	
	Daily	1,622(12.9%)	
	Employer	926(7.3%)	
	Self-Employed	3,474(27.6%)	
	Unemployed	326(2.6%)	
	Out-of-Labor Force	409(3.2%)	

Notes: * unit: 10,000 won (equivalent to about 8 US$) The number in parenthesis is standard error.

** The number in parenthesis is standard error.

*** Group 1 : male with middle school and lower, Group 2 : male with high school. Group 3 : male with college and over, Group 4 : female with middle school and lower. Group 5 : female with high school, Group 6 : female with college and over.

To simulate the wages unspecified for an individual, we divide each group further into 16 subgroups by industry (agricultural and home-service sector, manufacturing sector, financial and telecommunication service sector, and construction sector)[6] and occupation (high-level white-collar workers, service workers, mechanics, unskilled workers). For each of 96 subgroups we compute the mean wage at each age, which will be assigned to an individual in that subgroup at that age.

The new data set created in this way, which will be called the simulated data set, can be compared with the original data set in the mean wage and employment status. As is shown in Table 3, the two data sets show little difference in the mean

6) Manufacturing Industry also includes Electricity & Gas in this study.

wage or in the man employment status. The simulated data set allows us to demonstrate how the unemployment duration and wage incomes change over lifetime for each group i of workers. The cases for group 1, 2, 3 are depicted in the Appendix.

Finally, there is one important point we need to make about the simulated data set. To the extent that the original data set is based upon the crisis years of unusually high unemployment rates, the simulated data set is obtained on the presumption that the high unemployment rates persist all the time. In this respect, the estimation results in this paper based on the simulated data set would provide a relatively strict criterion for the relevance of an alternative system in Korea.

Ⅳ. Empirical Strategies

In this paper we will estimate for each alternative system the relative size Ri of unemployment benefit for an individual i and the distribution of Ri's. The distribution of Ri will give us information on the portion of those ending up with negative balance at the time of retirement for any given contribution rate. We will also simulate a sequence of IA balance over time for an individual under an alternative system, which will provide us with the data on the portion of those experiencing negative balance at each point in time. Before presenting the results on these in the next section, here we will briefly outline the formula for these estimations and the types of UISA and PUB to be simulated.

1. Formula for Relative Size of Unemployment Benefit and IA Balance Over Time

The relative size of unemployment benefit can be represented by the ratio of the amount of total unemployment benefit to one's lifetime income. The unemployment

benefit an individual receives for unit period of unemployment is determined by the replacement rate times the most recent wage received per period prior to unemployment. The replacement rate is set to be 0.5 in this study

Let Ii and Li be the measured lifetime income and the amount of total unemployment benefit for an individual i, respectively. Also, let Wit be the wage an individual receives at the age t. Then, an individual's lifetime income will be

$$Ii = tbitWit(1+r)-t, \quad (1)$$

where bit represents the portion of the year t for which an individual i is employed and r is the discount rate which is set to be 0.05.

On the other hand, the amount of total unemployment benefit Li for an individual i will be

$$Li = taitWit(1+r)-t, \quad (2)$$

where Wit is the wage that an individual receives just before being unemployed at the age t, and ait is the portion of the year t for which individual i is unemployed.

We can then compute the portion Ri of an individual's lifetime income Ii that covers the unemployment benefit Li as follows:

$$Ri = Li/Ii. \quad (3)$$

Also we can derive from (3) a distribution of Ri's for a given alternative system.

In simulating the IA balances Bit's over time for an alternative system, we assume the contribution rate si to be the same as s for all individuals. The balance Bit of the individual account (IA) at time t will then be

$$Bit = t\ (sbitWit\ 0.5\ aitWit)(1+r)-t. \quad (4)$$

A distribution of the simulated Bit's at each t for a given s will generate the portion of those experiencing negative IA balance at each point in time.

2. Simulating UISA and PUB

In simulating UISA or PUB, we assume that an individual starts to make his contribution at the age of 21. We also presume that an individual is not allowed to receive unemployment benefit for a certain number of years after graduation of schools. The introduction of this no-benefit period, which will be called the start-up period in this paper, accommodates an entitlement condition of a system, just like UI in Korea requires an individual to have been insured for at least 6 months before getting UI benefit.

The type of UISA we will simulate in this paper is the one that entails the same level of compensation as the current UI. This will allow us to see whether or not it would be desirable to replace the current UI by the UISA in Korea. The current UI in Korea can be characterized by the replacement rate of 50% and by the maximum benefit duration of 8 months. The actual duration of benefit for the unemployed is also constrained by one's age and the length of period for which he has been insured up to the time of unemployment, as well as by the maximum duration. The voluntary quitters are not eligible for UI benefit in Korea.

In computing the ratio Ri of unemployment benefit for an individual i to his lifetime income in Korea, we will accommodate these characteristics as much as possible given the limitations of the data set we use. First, taking into account the additional constraints on the benefit duration set by one's age and period of being insured, which are not specified in the data set, we will set the maximum benefit duration to be lower than 8 months in the simulation. In particular, we will set the maximum benefit duration in this simulation to be 6 months.

Second, we have to consider another fact that the UI excludes voluntary quitters from UI benefit. As we can see in Figure 1, the portion of involuntary unemployment out of the total insured unemployment is less than 50%. We will assume in this study that the probability that an unemployed individual is a voluntary quitter is 50% or that the exclusion of voluntary quitters reduces the cost

of Korean UI by half.

There are some aspects of the Korean UI that cannot be incorporated in this simulation study due to the data limitations. First, the data set we use does not fully reveal the duration of every unemployment an individual experiences. This is because, although the data set specifies the length of unemployment period for an individual in each year, it does not specify the starting or ending date of unemployment. Under this circumstance, even if we restrict the benefit duration of an individual to be no more than 6 months in a year, an individual may be paid UI benefit for more than 6 months in this simulation. If an individual is unemployed for more than 6 months over the two consecutive years but for less than 6 months for each of the two years, for example, he turns out to be paid for more than 6 months during one unemployment bout.

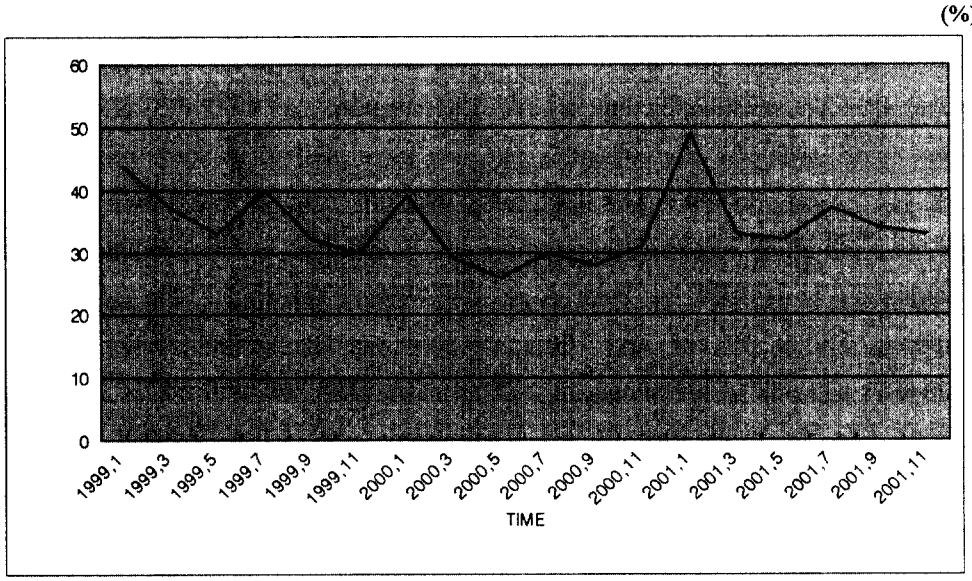
Second, the data set does not reveal whether or not an individual is insured by UI. In fact, the portion of the insured is less than 50% in Korea, mainly because most of the workers in informal sector temporary and daily workers , who constitute about 50% of the labor force in Korea, are not insured. In this study, however, we assume that all the workers are insured.

Given the above presumptions imposed by the data limitations, as well as the data set which is based upon the years of unusually high unemployment rates, the relative size Ri of unemployment benefit under the UISA is likely to be overestimated. In other words, the simulation results based upon the presumptions and the data set would give us a relatively tough test for the relevance of the UISA in this paper.

As for the type of PUB we will simulate in this paper, we will set the level of unemployment benefit it offers to be more extensive than the UISA we study. This would be justified by the fact that PUB sets a high contribution rate relative to the UISA.

First, we will set no limit to the duration of benefit under PUB. That is, PUB offers the unemployed 50% of their previous incomes as long as they are unemployed. Second, we will include voluntary quitters as qualified for the unemployment benefit of PUB.

Figure 1. Ratio of Involuntary Unemployment To Total Insured Unemployment



Source: Ministry of Labor, *Employment Insurance Report 2002*, Korea.

V. Results

1. Unemployment Insurance Savings Account (UISA)

Table 4 depicts a distribution of Ri's under the UISA that offers the same benefit as the current UI in Korea. Note that Table 4 indicates the cumulative percent for each Ri, i.e., the portion of those whose lifetime unemployment benefit is smaller than the total contribution he makes at the rate of Ri. We can thus derive from Table 4 the portion of those ending up with negative balance at the time of retirement for any given contribution rate. If the contribution rate is given as 2%, for example, the portion of those with negative terminal balance would be 11.4% (=100-88.6) in Case 1.

The results in Table 4 demonstrate some interesting points. First, the total

unemployment benefit for an individual is about 1% of his lifetime income on the average, which is little sensitive to the length of start-up period. Second, in Case 2, the portion of those who end up with (-) IA balances at the time of retirement is 9.1% when the contribution rate is 2%. This suggests that the UISA offering the same benefit with 2% of contribution rate will leave most of workers with positive terminal balances of their IA's, indicating that this type of UISA will improve incentive efficiency substantially compared to UI. It might be the case that 2% of contribution would not be burdensome for workers relative to the current UI imposing 1% of UI tax upon them, because part of the contribution for an individual will add to his retirement income under UISA and will not be gone like UI tax. To the extent that 2% of contribution under UISA imposes upon an individual similar amount of burden to that under the current UI, we can argue that transforming the current UI into this type of UISA could be beneficial in Korea from the efficiency point of view.

Table 4. Distribution of Ri's under UISA

Ri (%)		0.6	1.0	1.2	1.8	2.0	2.4	3.0	3.6	4.2	4.8	5.4
Cumulative	Case1	28.5	52.2	62.1	83.1	88.6	92.9	97.0	98.4	98.7	99.9	99.9
Percent	Case2	33.2	57.2	67.6	87.6	90.9	95.5	98.7	99.7	99.8	99.9	99.9

Case 1 : 1 year of start-up period Average Ri = 1.08%.
Case 2 : 2 years of start-up period Average Ri = 0.99%.

Third, if the contribution rate of UISA is set to be 1%, i.e., the same rate as UI tax rate, the portion of those with (-) terminal balance of their IA's will jump to as high as 42.8%. The high rate of those with (-) balance could lead one to believe that we may not be able to expect much efficiency gain by replacing the current UI with the UISA of the same benefit and contribution levels. However, there are a couple of important factors that are responsible for the high rate of (-) balance. First, as mentioned above, unusually high rate of unemployment rate during the sample period and the reasons associated with data limitations tend to exaggerate the simulated level of unemployment benefit.

Second, as Table 5 shows, it is the group of non-regular workers (daily workers in particular) that contributes to the high rate of (-) IA balance. Excluding the non-regular workers, most of whom are not insured under the current UI, the portion of the regular workers with (-) terminal IA balance would be reasonably small (12.5%).

Table 5 demonstrates average ratio of unemployment benefit to one's lifetime income and the portion of (-) terminal IA balance under UISA by worker status regular workers, temporary and daily workers when the start-up period is 1 year. It indicates that the portion of those with negative IA balance at the time of retirement is smaller for regular workers than for temporary or for daily workers in general. This implies that the replacing UI by UISA would be quite effective for regular workers, whereas it may not be for daily workers. Especially when the contribution rate is 1%, we may not expect efficiency gain for the daily workers by changing toward the UISA. We can also see from Table 5 that replacement of UI by UISA would be more effective for the well-educated workers than for the less-educated ones.

Table 5. Distribution of Ri's under UISA by Group and by Worker Status

(Start-up Period = 1 Year)

		Group						Worker Status		
		G1	G2	G3	G4	G5	G6	Regular	Temporary	Daily
Mean Ri	Case A, B	1.73	0.91	0.70	0.93	0.83	0.26	0.94	1.02	1.25
Portion of Those Ending Up With (-) IA Balance	Case A	17.3	6.25	1.25	3.7	2.2	0.0	3.1	9.9	16.3
	Case B	71.1	27.0	5.4	16.6	9.9	0.1	12.5	36.1	70.2

Case A: Contribution Rate = 2%
Case B: Contribution Rate = 1%

From the equity point of view, on the other hand, UISA is clearly unfavorable compared to the current UI. To see this, we can check the welfare change for each of the six groups categorized by gender and education. Since there is no difference in benefit and contribution between UI and UISA in consideration, the only welfare

change comes from the balance in their IA's, which can be indicated by their Ri's. As we can see in Table 5, the average Ri tends to be higher for temporary and daily workers than for regular workers and higher for the well-educated workers than for the less-educated ones.

Although the total cost of unemployment can be fully financed by 2% of his lifetime income for most of individuals, an individual of a certain age (especially of young ages) may not be able to cover his unemployment benefit with his contributions accumulated. In other words, the interim IA balance often turns out to be negative for many individuals. Figure 2, which shows the portion of those experiencing negative IA balance at each age under the UISA with 2% of contribution, demonstrates that IA balance tends to be negative for a considerable portion of young workers although the negative balance may ultimately disappear by the retirement ages for many of them.

The high possibility of a negative IA balance over the wide range of ages for many individuals suggest that they may have adverse incentives to quit UISA at the time when their repayment balances are the largest. This is one of the weakest points of UISA. The general notion that this problem is particularly serious for temporary and daily workers whose employment status cannot easily monitored by the government seems to be justified. Figure 2 demonstrates that the portion of negative IA balance is higher and decreases more slowly for temporary and daily workers than for regular workers. This reflects the fact that regular workers tend to have higher employment stability as they get aged than non-regular workers do.

2. Pension-financed Unemployment Benefit (PUB)

Although more extensive benefit is provided by the PUB we study, the relative size of unemployment benefit is about 2.44 % or 1.74% of one's lifetime income on the average when the start-up period is 1 year or 5 years, respectively. In particular, Table 6 shows that, when the start-up period is 1 or 5 years, the amount of total unemployment benefit for an individual is less than 5% or 4% of his lifetime

income for about 90% of the workers, respectively. Remembering that the simulated data set is heavily affected by the data in the years of unusually high unemployment rates, we can argue that the contribution rate required to cover the unemployment benefit might be less than 3% during the normal years. Table 6 also shows that, when the contribution rate is 10%, virtually all the workers can finance their unemployment benefit by their accumulated contributions.

Table 6. Distribution of Ri's under PUB

Ri (%)		0.6	1.2	1.8	2.4	3.0	3.6	4.2	4.8	5.4	6.0	6.6	10.2
Cumulative	Case 1	12.2	27.1	42.9	57.3	68.9	78.0	84.9	89.3	92.5	94.9	96.4	99.8
Percent	Case 2	21.6	43.1	61.8	74.6	83.4	89.2	93.2	95.5	97.1	98.1	98.7	99.9

Case 1 : 1 year of start-up period Average Ri = 2.44%
Case 2 : 5 years of start-up period Average Ri = 1.74%

These simulation results provide us with the two important points. First, considering the fact that the rate of mandatory retirement savings is more than 10% in Korea, we can see that there is no individual who ends up with negative IA balance at the time of retirement under the PUB we study. In other words, we can expect PUB to fully support search incentives of the unemployed. Second, since the amount of unemployment benefit is fairly small compared to lifetime income for almost every worker, an individual can smooth out the consumption loss by unemployment over his lifetime and thus can render its burden small. This argument suggests that financing the fully extended unemployment benefit by retirement income would not impose risk burden upon risk-averse workers. In short, compared to the UISA, the PUB, which sets a higher contribution rate without causing additional distortion in consumption, can provide both more extensive benefit and more enhanced search incentives to the unemployed, while making small the risk burden associated with income fluctuation.

Also, unlike the UISA, the PUB is effective for non-regular workers as well. As Table 7 indicates, the probability that a non-regular worker ends up with a negative IA balance is almost zero under PUB, although it is still a little bit greater than

Table 7. Distribution of Ri's under PUB by Group and by Worker Status

(Contribution Rate = 10%, Start-Up Period = 5 Years))

	Group						Worker Status		
	G1	G2	G3	G4	G5	G6	Regular	Temporary	Daily
Mean Ri	3.17	1.90	1.07	1.25	1.25	0.29	2.15	2.26	2.78
Portion of Those Ending Up With (-) IA Balance	3.84	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.06

that for regular workers. And, as in the UISA, the least-educated male workers(group G1) are the ones for whom the PUB is the least effective. Notice, however, that, even for this group, the portion of those ending up with negative balance at the time of retirement is as small as 3.8%. In other words, the PUB works for non-regular and the less-educated workers better than the UISA.

Now let us turn to the interim IA balances under the PUB. Figure 3 shows how the portion of those with negative IA balance changes over time for a given contribution rate (or rate of mandatory retirement savings) when the start-up period is 5 years. Although the probability that the terminal balance of IA for an individual is negative is virtually zero for 10% of contribution rate, the interim balance of one's IA can be negative especially at his young ages. But the chance that an unemployed individual experiences a negative IA balance in the late 20's and early 30's is just about 2% (Figure 3), which is much smaller than that under the UISA as shown in Figure 2. And, for a contribution rate higher than 15%, virtually all the workers never experience negative IA balances at any age. That is, the PUB is in fact free of the sustainability concern, albeit its extended benefit.

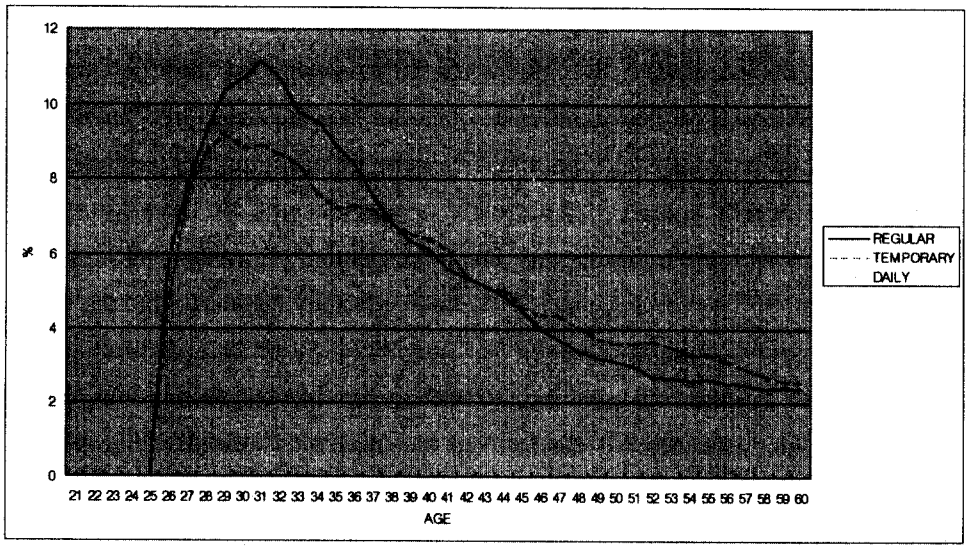
This is also true for the non-regular workers. Figure 4 shows that the probability that a negative balance continues to occur over a number of years is much smaller for non-regular workers under PUB than under the previous UISA, although it is a little greater than that for regular workers. In other words, unlike UISA, the PUB is not vulnerable to the adverse incentive to exit the system on the part of non-regular workers, whose employment records cannot be easily monitored by the government.

Finally, one can point out another important point about PUB (or UISA). If an

individual has his own savings (in addition to retirement savings or contribution to IA) which is sufficient enough to cover one's consumption whenever unemployed, the government arrangement such as PUB (or UISA) would not be necessary. In other words, the welfare advantage of PUB (or UISA) comes from the fact that it allows an unemployed individual to borrow against his future income. Note that, without PUB (or UISA), an individual would not in fact be able to borrow when unemployed due to the capital market imperfection. If it is often the case that an individual needs to borrow to secure the desired consumption under unemployment, i.e., if his savings that can be used for consumption under unemployment is often in short of the desired consumption, it will indicate that the PUB (or UISA) is welfare-increasing.

In general, an individual saves about 25% of his income on the average in Korea. Taking into account the fact that a large portion of the savings is set aside for retirement, housing and education for his children, however, we can argue that an individual's precautionary saving against unemployment contingency, if any, would

Figure 5. Portion of Negative Balance Under PUB By Worker Status(Contribution Rate = 5%)



not exceed 5% of one's income. The Figure 5 shows that when an individual makes precautionary savings as much as 5% of his income as PUB is not available, more than 10% of the total individuals are in need of borrowing in their late 20's to get the same consumption level as they can under PUB. This indicates that PUB is quite effective due to the capital market imperfection. Figure 5 shows that the need for borrowing upon unemployment would be greater for daily workers than for regular workers, implying that the effectiveness of PUB in terms of individual ability to borrow is much greater for daily workers than for regular workers.

Ⅵ. Conclusion

The efficiency advantage of UISA or PUB comes from the fact that it can enhance search incentive of an unemployed worker by financing his unemployment benefit with his own contribution, while making the risk burden associated with the resulting income fluctuation small. For these effects to be relevant in reality, however, the total amount of unemployment benefit of an individual needs to be small relative to his total contribution under UISA or PUB.

Using the simulated data set which is based upon the data set merging Economically Active Population Survey(EAPS) and the Supplementary Survey (SS) in 1998-2001, this paper yields by simulation the estimates of the relative size of unemployment benefit and IA balance under a specific type of UISA or PUB in Korea. It is shown, for example, that the total amount of unemployment benefit, which is paid to the unemployed including voluntary quitters for the whole unemployment period, can be financed not only by 2 % of an individual lifetime income on the average but also by 10 % of the lifetime income for all the individuals. Taking into account the fact that the data set is based on the years of unusually high unemployment rates in Korea, we can argue that the relative size of unemployment benefit for an individual is fairly small compared to his lifetime

income.

These estimates lead to the two important results. First, replacing UI by UISA with the same benefit being maintained would be beneficial in terms of search efficiency in general, although its effectiveness is a little doubtful as for the non-regular workers such as temporary and daily workers. On the other hand, the sustainability of UISA may be questionable as many workers receive unemployment benefit in excess of their contributions especially at their young ages, which has to be repaid later. This problem turns out to be more serious for the non-regular workers.

Second, the PUB is better than UISA as an alternative to UI, and also works relatively well even for the non-regular workers. The superiority of PUB results from its relatively high contribution rate (or rate of mandatory retirement savings) compared to UISA. Note that the UISA would find it difficult to impose a high contribution rate upon individuals who already makes a considerable rate of mandatory retirement savings (at least 10% in Korea). The high contribution rate of PUB will lead to low probability that an individual experiences negative IA balance at each age up to the retirement, resulting in favorable incentive for search and favorable sustainability of the system. The simulation results show that the incentive and sustainability effects of PUB also turn out to be relevant in the case of non-regular workers in Korea. One possible problem of PUB is that it could subject risk-averse workers to more fluctuation in retirement income compared to the UISA. To the extent that the total unemployment benefit is small relative to lifetime income, however, the risk burden associated with income fluctuation becomes small under the PUB due to intertemporal consumption-smoothing over the lifetime. With the efficiency advantage in terms of search incentive, sustainability and consumption-smoothing effect, therefore, the PUB would be able to offer the unemployed more extensive unemployment benefit than the UISA.

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Appendix

Figures on Unemployment Duration and Wage Incomes For Group 1-3

Figure A Unemployment Duration and Wage Income For Group 1

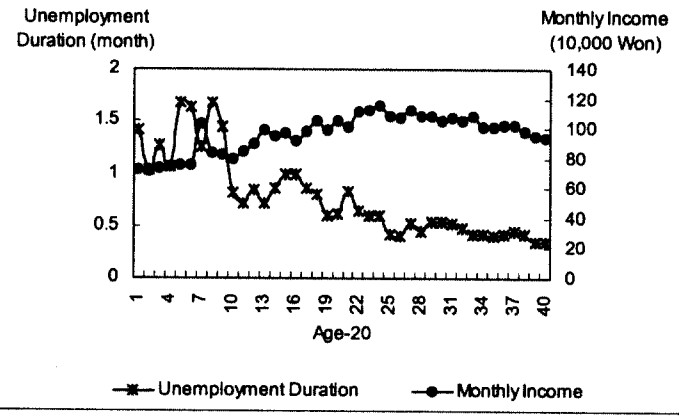

Figure B Unemployment Duration and Wage Income For Group 2

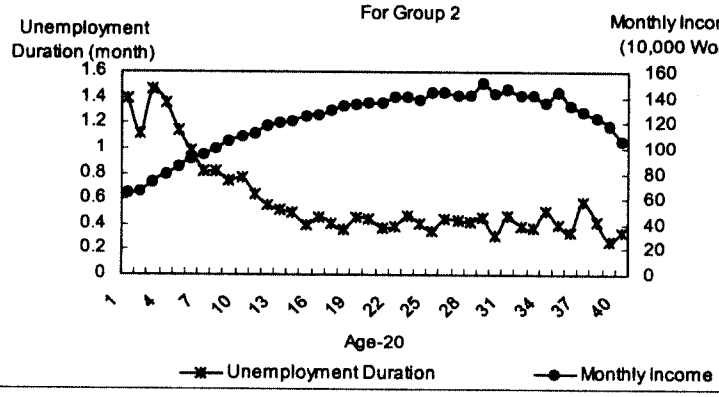

Figure C Unemployment Duration and Wage Income For Group 3