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This article extends and improves on the previous paper of the author (Lee 2007) by utilizing the newly released 2005 population census, offering a new literature survey, and conducting some additional analyses. I thank J. Kwon for the research assistance and the participants of the 19th NBER East Asian Seminar on Economics, especially Kyungsoo Choi, Takatoshi Ito, Fumio Ohtake, and Andrew Rose, for their helpful comments and suggestions. The errors in this report are solely the responsibility of the author. The views expressed herein are those of the author(s) and do not necessarily reflect the views of the National Bureau of Economic Research.

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ABSTRACT

This study estimates the labor force participation rate (LFPR) of older males in Korea from 1955 to 2005, and analyzes the effects of several determining factors on labor force participation decisions at older ages. The LFPR of older men increased substantially from the mid-1960s to the late-1990s. This pattern is in sharp contrast to the historical experiences of most OECD countries, where the LFPR of older males declined rapidly over the last century. The rise in the LFPR of older males in Korea between 1965 and 1995 is largely explained by the dramatic increase in the labor-market activity of the rural elderly population. The results of regression analyses suggest that the acceleration of population aging in rural areas due to the selective out-migration of younger persons was the major cause of the sharp increase in the LFPR of older males. It is likely that the relative decline of the rural economy in the course of industrialization made it increasingly difficult for the rural elderly population to save for retirement.

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1. Introduction

This article estimates the labor force participation rate of older men in Korea for the last fifty years, and provides explanations for the patterns of long-term change in retirement behaviors. This study found that the LFPR of older men increased substantially from the mid-1960s to the late-1990s, in sharp contrast to the historical experiences of most OECD countries, where the LFPR of older males declined rapidly over the last century. The rise in the LFPR of older males in Korea between 1965 and 1995 is largely explained by the dramatic increase in the labor-market activity of the rural elderly population. The study suggests that the acceleration of population aging in rural areas due to the selective out-migration of younger persons was the major cause of the sharp increase in the LFPR of older males. Likewise, evidence provides the suggestion that the LFPR of older males that fell dramatically after 1997 was due to the adverse labor-market effect of the financial crisis.

Population aging is one of the most critical economic and social issues in many nations today. Due to the rapidly rising life expectancy and low fertility rates, the proportion of the elderly population has been increasing with an alarming speed in most of the developed countries and in many of the emerging nations as well. Korea is no exception to this global process of population aging. In fact, its current pace of aging is much faster than that most of the OECD countries.[2] The proportion of the population aged 65 and older is currently 10 percent, and projected to increase to 23 percent by 2030. It is anticipated that the increase in the relative size of the elderly population will radically change the fundamental features of the economy and society. Labor shortages, lowered productivity, and intensified financial pressure on the social insurance programs are among the most frequently mentioned economic consequences of the ongoing population aging. Thus, it is no surprise that there was a recent surge in research on fertility decline and the health of the elderly populations, the major determinants of the pace of the population aging.

[2] The United Nations classifies a nation in which the share of the population aged 65 and older is 7 percent or higher as “aging society,” and a nation in which the population aged 65 and older is 14 percent as “aged society.” It is expected that Korea will transform from an aging society (2000) to an aged society (2019) in just 19 years, whereas it took 115 years for France, 72 years for the U.S., and 24 years for Japan to complete the same kind of transition (Korea National Statistical Office 2001).

For economists, especially those who specialize in labor economics and public finance, a central research topic related to population aging is the trend and determinant of the labor force participation of older individuals, especially males. One of the most marked labor-market changes in developed countries over the last several decades has been the sharp decline in the labor force participation rate (LFPR, hereafter) of older males. In the countries that industrialized ahead of the others, the long-term decrease in the labor market activity of elderly males began even earlier. In the U.S., for example, nearly four out of five men aged 65 and older were gainfully employed in 1880. Today, less than 20 percent of males at these ages participate in the labor market. Similar trends in the LFPR of older men are observed in Great Britain and Germany for the same period (Costa 1998).

Early retirement, defined as leaving the labor force permanently before reaching the age of 65, also became common in most OECD countries over the last four decades. In Germany, Belgium, the Netherlands, and France, the LFPR of men aged 60 to 64 fell from over 70 percent in the 1960s to around 20 to 30 percent in 1995. Other countries such as the U.S., Sweden, Spain, and Italy experienced a relatively modest but nevertheless substantial rise in early retirement during the same period. Japan is an exception among the OECD countries, showing a relatively stable LFPR for men aged 60 to 64 over time (Gruber and Wise 1999, Abe 2001, OECD 2004).

As the increase in the relative size of the aged population has accelerated, this changing retirement behavior has become a major social issue in developed countries. It is feared that the fall in the labor market activity of this growing age group will aggravate the problems anticipated to arise from population aging, such as labor shortages and financial pressure on pension funds (Lee 2001, Nyce and Sylvester 2005). A key policy measure proposed in response to the potential labor-market problems associated with the aging of society is to boost the employment of older workers. A better understanding of the labor market behavior of older individuals will provide a useful basis for making effective policies.

The purpose of this study is to estimate the LFPR of older men in Korea for the last fifty years, and to provide an explanation for the patterns of long-term change in retirement behaviors. Reflecting the growing interest in the economic impacts of

population aging, a number of studies have recently examined the labor-market status of aged workers in Korea. However, as will be discussed below in detail, these studies cover a relatively short period in recent years and have some limitations arising from relatively small samples of the elderly population. The present study can overcome some of these limitations by analyzing micro samples of the Censuses covering longer periods of time.

Recent progress in the comparative study of the economics of aging has been remarkable, as can be seen in the research of Gruber and Wise (1999, 2004), OECD (2000), and Ogura, Tachibanaki, and Wise (2001). However, existing studies have focused mainly on Europe, North America, and Japan. Korea certainly shares with the other OECD countries a lot of common features in retirement patterns. As such, there is no reason to believe that standard economic models of retirement that have been utilized in studying the cases of developed countries cannot be applied to Korea. On the other hand, some of its labor-market and institutional characteristics are distinct from those of the other advanced countries. For example, the self-employed account for a much higher proportion of the labor force, especially those aged 45 and older in Korea than in the other nations with a comparable phase of economic development. In addition, the Korean social insurance programs for old-age security are less developed than most of the other OECD countries. These are major explanations for the relatively high labor-market activity of older males in Korea although the high labor force participation rate does not mean employment stability. It is largely acknowledged that retirement from formal wage and salary jobs in Korea is more forced than voluntary, especially after the Financial Crisis (Chang 2003, Cho and Kim 2005). Due to these particularities, the retirement behaviors of Korean older males could differ from the other populations. In this light, this study may add some additional insights to the comparative study of retirement.

2. Background

Due to the growing interest in the economic impacts of population aging, the determining factors of retirement decisions and the causes of the secular decline in the LFPR of older men have attracted the attention of many economists in recent years.

They have attributed the decline in the involvement of older males in the labor market to the factors that influence labor supply decisions of older persons. In particular, a great deal of attention has been paid to the retirement effect of the implementation and expansion of social insurance programs such as the Social Security. A particularly large number of studies have focused on the impact of the implementation and expansion of the social insurance programs, especially social security, on the labor force participation of older men (Boskin 1977, Parsons 1980 1991, Hurd and Boskin 1984, Krueger and Pischke 1992, Lee 1998a, Gruber and Wise 1999, 2004).

As for the U.S., it has been suggested that the Old Age Assistance (OAA) was the main underlying force behind the sharp decline in the LFPR of older men during the 1930s (Parsons 1991). Many have attributed the fall in the LFPR of older males starting in the 1960s to the increase in the real Social Security benefits (Boskin 1977, Parsons 1980, Hurd and Boskin 1984). Recent comparative studies have concluded that measures of work disincentives arising from old-age pension programs were strongly related to the size of labor-market activity of older males around the world (Gruber and Wise 1999, 2004). Aside from the Social Security, the major supply-side factors of retirement that the existing literature suggests include health status (McGarry 2004), health insurance (Gruber and Madrian 1995), and wealth (Gustman and Steinmeier 2002).

Although studied less extensively than supply-side factors, demand-side factors such as the features of the workplace, production technology, managerial practices, work organization, employment relations, and labor market conditions, are also potentially important determinants of retirement decisions. For example, Hurd (1996) and Hurd and McGarry (1993) found that the flexibility of the job and financial aspects were important determinants of retirement decisions. It has also been reported that shifts in the industrial structure increased the pressure toward retirement by diminishing the relative size of the sectors that were more favorable of the employment of older workers (Lee 2002, 2005). A recent study by Lee (2009) suggested that technological changes strongly affected the labor-market status of older male manufacturing workers in early twentieth century America.

In Korea, research on the labor-market status of older persons has been growing

over the last decade, reflecting the rising concern over the coming of the aging society. In recent years, a large number of in-depth-studies on retirement have been produced, utilizing newly released micro-panel data, such as the Korea Labor and Income Panel Survey (KLIPS) and the Korea Longitudinal Study of Aging (KLoSA). An example of these studies is the undertaking by Chang (2002) which was based on the data from the 2000-2001 KLIPS. Chang reported that the odds of retirement were associated negatively with health and educational attainment, and positively with real estate wealth. She also suggested that the average retirement age of Korean males increased by two years from 1987 to 1997, before it began to decrease after the financial crisis in 1998.

Cho and Kim (2005) investigate the nature of mandatory retirement in Korea using the data from the Workplace Panel Survey (WPS). They find that Korean corporations, especially after the financial crisis in 1998, use mandatory retirement as a means to deal with exorbitant wage increases that outpace productivity and were in part generated by the traditional seniority-based wage system. According to this study, mandatory retirement for many firms also plays an alleviating role to the problem of backlogs in promotion by circumventing the rigidity of the personnel dismissal system under the Korean labor law. Finally, this study suggests that the labor unions may tacitly approve this practice.

Sung and Ahn (2006) examine the determinants of the decision of older persons to work, based on the data from the KLIPS. They also investigate the factors that determine the classification of workers as fit for wage and salary jobs or self-employment. They find that age and years of schooling are negatively related to the probability of employment of individuals aged 45 and older. Healthier persons are more likely to be employed than those who reported poor health. Local unemployment rate has a strong negative effect on the probability of employment. Individuals who were employed as non-wage workers at the age of 45 are more likely to be employed today than those employed in wage and salary jobs, suggesting that job characteristics are important determinants of employment decisions.

By analyzing a sample of two-earner households drawn from the KLIPS, Choi (2006) finds that the retirement decisions of husbands are significantly affected by the health and wages of the spouses, as well as their own pension wealth and other

retirement incentives. In contrast, the results show that the retirement behaviors of the wives are not strongly influenced by the characteristics of their spouses. By estimating the cross wage elasticity of retirement of the couples, this study suggests that the leisure times of a couple complement each other, and that the complementarities are much stronger for men than for women. For men, the substitution effect of the wages of their spouses dominates the income effect, whereas, substitution and income effects cancel out for women.

Lee (2008) explores how retirement expectations differ between the self-employed (SE) and wage and salary earners (WS) and why they differ. The results generally confirm the widely held belief that the SEs expect to remain in the labor market longer than the WSs. Differences in the retirement incomes, health, productivity, job characteristics, and the presence of compulsory retirement in the workplaces of the WSs do not explain the observed disparity in the retirement expectations by employment status. This study suggests that the difference between the SE and WS in the quality of matching between the job and the worker is an important factor explaining the late retirement of the SE compared to WS.

These studies provide useful implications for the reasons why older Korean workers leave the labor market. However, the data used in these studies only cover recent years. The KLIPS started with the year 1998, and the first wave of the KLoSA was collected in 2006. Furthermore, recent studies based on the micro panel data, such as KLIPS, are subject to limitations arising from the relatively small sample of the elderly population. The present study can overcome some of these limitations by analyzing the micro samples of the censuses that cover a longer period.

3. Data and Definition of Labor Force Participation

This study is largely based on the Population and Housing Census (Census, hereafter), provided by the National Statistical Office of Korea (Korea National Statistical Office 1955, 1960, 1966, 1970, 1975, 1980, 1985, 1990, 1995, 2000, and 2005). In particular, the micro samples of the censuses for 1980, 1985, 1990, 1995, 2000, and 2005 are the principal basis for the empirical analysis of the labor force participation patterns of older males. Additionally, the Economically Active Population

Survey (EAP, hereafter) is used in estimating the LFPR of older males.

The EAP is the most widely used micro-level labor survey that provides basic information on employment and unemployment in Korea. One advantage of this source over the census data is the continuous yearly estimate of the LFPR from 1963 through today can be obtained from the data. In addition, by using this survey we can consistently apply to each year the most widely used definition of employed and unemployed persons as labor force participants.

The employed are defined as all persons who work at least one hour or more for pay or profits, including those who work 18 hours or more as unpaid family workers during the reference week. Persons who have a job but are temporarily absent from work due to bad weather, temporary illness, and other reasons are also classified as employed. The unemployed include all persons who are not working at all, but are available for work and are actively seeking work during the reference week. Those who are not working or seeking work, but are expected to start a new job within a month of the reference week, are also considered as unemployed (Korea National Statistical Office 2001).

A disadvantage of using the EAP is its relatively small sample size. Prior to 1988, only 17,500 households were sampled in the survey. Since the percentage of the elderly population then was much smaller than it is today, the sample size of older males may not be large enough to generate a reliable estimate of their LFPR. This potential problem can be mitigated with the current data because after 1988, the number of sample households increased to 32,500.

The Census Report has been published every five years since 1949. With a large sample size, it is a better source of data for in-depth analysis focusing on the elderly population. It also provides a data on a broad range of socioeconomic variables that are not available from the EAP, such as the characteristics of housing and place of residence, and a much finer classification of family structure.

When using the Census, the researcher makes the definition of labor force participation as close as possible to that of the EAP. For the Censuses from 1955 through 1980, the published reports provide the number of the employed and the unemployed for each 5-year age interval. The Census Reports for 1960, 1965, 1970, and

1980 further divide the unemployed according to whether they were seeking a job. Accordingly, for these years, labor force participants are defined as the employed and those unemployed who were seeking a job. For 1955 and 1975, all employed and unemployed persons are classified as participants. Since the number of the unemployed among men aged 60 and older is very small for these two years, the inclusion of the unemployed not seeking a job does not make a significant difference.[3]

The two-percent random samples of the censuses for 1980 through 2005 provide a finer classification of labor force status.[4] The following categories are classified as labor force participation: (a) working, (b) working occasionally while taking care of household affairs, (c) working occasionally while going to school, (d) working occasionally while doing other things, (e) temporarily absent from work, and (f) seeking a job. The following categories are regarded as non-participation: (g) housekeeping, (h) schooling, and (i) not working for other reasons, such as old age or sickness. The overwhelming majority of men aged 50 and older falls into categories (a) and (i). The results of the estimation of the LFPR and the analyses regarding the determinants of labor force participation are therefore not sensitive to whether these categories (b to h) are classified as participation or not.

4. Long-Term Trend in the LFPR of Older Males

Table 1 reports the long-term trend in the age-specific LFPR of males aged 50 and older from 1955, estimated from the Census. Figure 1 graphically presents the estimates of the LFPR of males aged 60 and older from both the Census and the EAP. The most remarkable feature of the observed long-term trend is that the LFPR of males aged 60 and older in Korea *increased*, not decreased, between the mid-1960s and the late 1990s. According to the results based on the EAP, it rose from 40 percent in 1965 to

[3]The percentage of the unemployed among the male population aged 60 and older was 0.001 percent in 1955 and 0.5 percent in 1975.

[4]The published census reports after 1980 classify the population into two categories of labor force status, the gainfully employed and the non-employed. The former includes full-time and part-time workers and persons who have a job but are temporarily absent from work. The latter comprises the unemployed, unpaid family workers, students, and other non-participants. Since the published reports provide the number of age-specific population only for these two large categories, it is impossible to obtain an estimate of the LFPR that is comparable to the estimate based on the EAP or earlier Census Reports.

55 percent in 1997. The estimate from the Census shows a similar trend, with the LFPR rising from 44 to 53 percent between 1965 and 1995. This pattern is sharply distinct from the historical experience of most of the other OECD countries, as noted in the introduction. The long-term rise in labor-market activity is less visible for males in their fifties. The LFPR of men aged 50 to 59 based on Census rose from 70 percent in 1965 to 72 percent in 1995.

< Table 1 here>

< Figure 1 here>

The three decades of long-term increases in the labor-market activity of older men were followed by a dramatic exodus of aged workers from the labor force from 1997 to 2000. The LFPR of males aged 60 and older estimated from the Census fell by 7 percentage points between 1995 and 2000. Males aged 50 to 59 experienced an even greater decline in economic activity. The LFPR of men aged 55 to 59, for instance, dropped from 85 percent in 1995 to 72 percent in 2000.

The LFPR of men aged 60 and older for the period from 1955 to 1965 estimated from census reports suggests that the labor-market activity of aged men was initially high and then declined dramatically with the beginning of industrialization, similar to what happened in other developed countries. If this pattern is confirmed, the truly special feature of the Korean experience is the turnaround of the trend in the middle of the 1960s. However, since the quality of the Censuses prior to 1965 was relatively poor, it is difficult to tell whether the drop in the LFPR of older men in the earlier period was real.

Another prominent feature of this analysis is the uneven change over time in the LFPR of older males in Korea. In particular, the series based on the EAP prior to the mid-1980s exhibits highly volatile year-to-year fluctuations. This is presumably due to the small sample size of the EAP prior to 1988, as previously noted. Consistent with this conjecture, the trend of the LFPR based on the EAP shows a much more continuous change after 1988, when the sample size nearly doubled. According to the estimates from the EAP, the LFPR of older men rose between the mid-1960s and the mid-1970s, fell during the following 10 years, and then rapidly rose from the mid-1980s to 1997. The estimates of the LFPR from the Census generally matched those obtained from the

EAP. The only exception is 1985, for which the Census shows a much higher rate of labor-market activity of older males than does the EAP. Due to the discrepancy in the 1985 period, the trend estimated from the Census is somewhat different, with the economic activity of older men rising greatly between 1965 and 1970, remaining relatively stable over the next 20 years, and then increasing sharply between 1990 and 1995.

It is too early to determine whether the sharp decrease in the LFPR of older men between 1997 and 2000 heralds the beginning of the same long-term decline in the labor-market activity of the elderly that has already been taking place in developed nations. It may simply reflect a temporary discouraged-worker effect resulting from the poor labor market prospect during the period of the financial crisis. Given that the decreasing trend of the LFPR of older men has been reversed since 2000, the latter story seems more likely. In addition, it appears that the labor-market activity of older workers was at least strongly influenced by the recession during the financial crisis and subsequent restructuring of the economy. The fall in the LFPR was particularly pronounced for men aged 50 to 64, whose unemployment rate was higher than that of men aged 65 and older. Likewise, as will be seen below, the fall in labor-market activity was much greater in urban areas than in the countryside. However, since the main focus of this study is the long-term trend, the causes of the sharp decline and the rise in the LFPR of older males from 1997 will not be scrutinized here.

The rise in the LFPR since the mid-1960s of men aged 60 and older is not an artifact of a change in the age distribution. As indicated in Table 1, an increase in the LFPR is observed for three different age groups, 60-64, 65-69, and 70 and older. As a matter of fact, had the age distribution remained unchanged since 1965, the LFPR of men aged 60 and older in 1995 would have been practically the same as the actual rate, 51.9 percent instead of 52.5 percent.[5] A comparison of the age-LFPR profiles for 1980, 1995, 2000, and 2005, presented in Figure 2, provides a more detailed structure of age-specific change in the LFPR for men aged 50 and older since 1980. Between 1980 and 1995, the rise of the LFPR was greater for men in their fifties and seventies than for

[5]Calculated based on the relative size of each age group in 1965 and the age-specific LFPR as of 1995, reported in Table 1

men in their sixties. For the period 1995 to 2000, as noted above, the exit from the labor force was concentrated among men aged 50 to 64.

<Figure 2 here>

The size and time trends of the LFPR of older males were sharply different between urban and rural areas and between farm and non-farm households. The Census reports classify lands into three administrative categories according to the degree of urbanization: *Dong*, *Eup*, and *Myon*, roughly corresponding to city, town, and countryside, respectively. Table 2 and Figure 3 present the age-specific LFPR of men aged 60 and older for rural areas (Myon and Eup areas combined) and cities (Dong areas). It is evident from the results that the rise in the LFPR of older males in Korea between 1965 and 1995 is largely explained by the dramatic increase in the labor-market activity of the elderly population in rural areas. The LFPR in rural areas increased by 30 percentage points from 46 percent in 1965 to 70 percent in 1995, in sharp contrast to a rise of only 4 percentage points among urban-dwellers. Within the rural areas, the aged men in the countryside (Myon areas) experienced a much greater increase in participation than those living in towns (Eup areas). These, however are not reported here. Similar patterns are observed for each of the three age groups, 60-64, 65-69, 70 and older.[6]

<Table 2 here>

<Figure 3 here>

The LFPR of older males has been higher among the rural population than among city-dwellers throughout the period under study. The greater labor-market activity of the aged in rural areas probably results from the greater flexibility of self-employment in such work as farming. Since health, desire to work, and other factors that affect labor force participation change gradually as a person gets older, an aging person might prefer to reduce the amount of work step by step rather than to work

[6] If the elderly population is classified into persons residing in farm households and those living in non-farm households, a similar result emerge. The LFPR of men aged 60 and older residing in farm households increased from 47 percent in 1965 to 78 percent in 1995. By contrast, the male LFPR of the same age group dwelling in non-farm households rose only modestly, from 33 to 42 percent during the three decades. These results suggest that the rise in the LFPR of older males in Korea between 1965 and 1995 was largely a rural and agricultural phenomenon.

fulltime and then retire completely. Gradual retirement is an option for the self-employed who are able to reduce the hours and intensity of work to some extent.[7] Moreover, the self-employed are less likely to be covered by employer-sponsored or public pension plans than wage earners. Therefore, it would be more difficult for the rural elderly population to finance retirement. In addition, the economic status of the rural population has been unfavorable compared with that of the urban population, particularly in recent years.

Since the 1960s, the proportion of the elderly male population living in urban areas has rapidly increased. The percentage of the population among males aged 60 and older who resided in urban areas increased from 17 percent in 1960 to 60 percent in 2000 (Table 2). Similarly, the share of men aged 60 and older residing in farm households decreased from 72 percent in 1965 to 34 percent in 1995. This implies that, other things being equal, the LFPR of older men would have declined as a result of the shift toward the urban and non-farm sectors. In the case of the U.S., the decline of agriculture explains a substantial fraction of the fall in the LFPR of older men between 1880 and 1940 (Lee 2002, 2005). In Korea, the dramatic increase in the LFPR of aged men in rural areas more than offsets this countervailing force resulting from urbanization and agricultural decline.

It is unclear why aged workers in rural areas remain in the labor force much longer today than they did forty years ago. A possible explanation is the impact of the mass migration of the rural population into the urban and non-agricultural sectors (Yoon 1984, Moon et al. 1991, Lee 1993a, Kim et al. 1997). The relative importance of farm households, which accounted for 54 percent of all households in 1960, has since rapidly declined. In 1995, 40 percent of the economically active population (those aged 14 and older) lived in the rural areas, compared with 65 percent in 1966. The selective out-migration of younger people has accelerated the aging of the population in rural areas. The proportion of individuals 60 and older to the population aged 14 and over increased from 11 to 25 percent between 1966 and 1995, and rose from 6 to 9 percent in urban

[7]For instance, aged farmers can reduce the amount of work efforts by adjusting acreage and crop-mix or by adopting mechanization (Pedersen 1950). In the U.S., the LFPR of older males was likewise higher in the farm than in non-farm households throughout the late nineteenth and the first half of the twentieth century (Lee 2002).

areas. In 1995, 30 percent of the economically active population living in the countryside (Myon) was composed of persons 60 and older.

This aging of the rural population may have produced a rise in the LFPR of older men for the following reasons: first, if young and older workers are substitutes in the labor market, the out-migration of the young may have increased the value of aged workers' marginal labor productivity, thereby raising the opportunity cost of retirement. Second, the self-employed, the farmers in particular, may have been forced to work longer because of the loss of family labor. The potential effect of population aging on the labor force participation decisions of older workers will be examined below.

5. A Regression Model of the Labor Force Participation Decisions at Older Ages

In this section, the determinants of labor force participation decisions of older males are examined. More specifically, it is estimated how the probability of labor force participation was affected by a number of potential factors in labor force participation decisions, such as age, education, marital status, family size, home ownership, residence in urban areas, and the extent of population aging and the industrial structure in the place of residence. Furthermore, the time and cohort effects on the economic activity of older men are considered. The results of this analysis not only reveal the patterns of retirement at a particular point of time, but also provide useful insights into the cause of the changes in the LFPR of older males over time. The logit regression analyses provided below are based on a pooled sample of the Censuses of 1980, 1985, 1990, 1995, 2000, and 2005.

The analyses start with a simple standard model of labor force participation decisions based on a choice between work and leisure.[8] At any given date, a person will choose either retirement or labor force participation based on his or her utility associated with each option. Well-being when working can be written as:

(1) $$U_W(Y + N, \overline{H}; \mathbf{Z})$$

and utility when not working as

(2) $$U_R(N, 0; \mathbf{Z})$$

where Y is labor income, N is non-labor income, $\mathbf{Z}$ is a vector of demographic and

[8]The model given below is a modified version of the model used in Costa (1998, chap. 3).

socioeconomic variables to affect utility, and $\overline{H}$ is hours of work in the labor market. A decision function can be given as

(3) $$I^* = U_R(N,0;\mathbf{Z}) - U_W(Y+N,\overline{H};\mathbf{Z})$$

Although the value of I^* is not observed, a discrete retirement indicator is observed, given by $I = 0$ if $I^* < 0$, = 1 otherwise, where 1 represents retirement and 0, labor force participation.

The decision function evaluated by the individual can be presented as

(4) $$I^* = U_R(N,0;\mathbf{Z}) - U_W(Y+N,\overline{H};\mathbf{Z}) = -\mathbf{X}'\beta - A\alpha - C\gamma - Y\varphi + \varepsilon$$

where **X** is a vector containing proxy variables for Y, $N, \overline{H}$, **A** is a matrix of age dummies, **C** is a matrix of cohort dummies, **Y** is a matrix of year dummies, $\beta, \alpha, \gamma,$ and φ are parameter vectors, and ε is an error term. Using the indicator function I, the effects of the variables will be estimated by means of a logit,

(5) $$\text{Prob}(I = 1) = \text{Prob}(\varepsilon < \mathbf{X}'\beta + A\alpha + C\gamma + Y\varphi)$$

$$= \frac{\exp(\mathbf{X}'\beta + A\alpha + C\gamma + Y\varphi)}{1+\exp(\mathbf{X}'\beta + A\alpha + C\gamma + Y\varphi)} = \Phi(\mathbf{X}'\beta + A\alpha + C\gamma + Y\varphi)$$

Since there is a linear relationship across the three matrices **A**, **C**, and **Y**, the matrices of the dummies satisfy

(6) $$As_a = Cs_c + Ys_y$$

where the s vectors are arithmetic sequences {0,1,2,3,….} of the length given by the number of columns of the matrix that premultiplies them. Since equation (6) is a single identity, it is impossible to estimate the equation (5).

To circumvent this problem, the following methods are employed. First, cohort dummies are dropped from the regression equation, ignoring the cohort effect. Second, adopting the method used by Deaton (1997, Chapter 2), the age, cohort, and year effects are normalized assuming that any secular time trend in the LFPR of older men is attributable to the age and cohort effects and that the year effect captures the cyclical fluctuations or business cycle effect. A normalization that accomplishes this makes the year effect orthogonal to a time-trend, so that,

(7) $$s_y'\varphi = 0$$

To estimate the equation (5) subject to the normalization given by equation (7), three year dummies defined as follows, from t = 3, 4, 5 are included in the regressions.

$$(8) \qquad d_t^* = d_t - [(t-1)d_2 - (t-2)d_1]$$

where d_t is the usual year dummy. This procedure satisfies the restriction (7), as well as the restriction that the year dummies should add to zero. The coefficients of the d_i^* give the third to the final year (1990 through 2005 in the present case) coefficients. The first and second can be computed from the two restrictions that all year effects add to zero thus, satisfying equation (7).

For many developed countries, especially the U.S., a large number of studies have investigated the determinants of the timing of retirement. Some independent variables widely used in those studies include age, education, health status, characteristics of prior occupation, the size of the pension income, and family structure (Parson 1980, Hurd and Boskin 1984, Krueger and Pischke 1992, Costa 1998, Lee 1998b, 1999). Age, educational attainment, and health status are proxy variables for the individual's productivity in the labor market, which determines the opportunity cost of retirement. Health, family structure, and job attributes such as flexibility and physical demands are believed to be associated with the preference for work. Though it would be desirable to consider all the potential determining factors of labor force participation of older men, the selection of explanatory variables used in this study was limited by the information available from the data.

In the regression analyses, the following variables are included. Age is included as a dummy variable for each of the five-year age intervals.[9] Educational attainment is represented by the dummy variables denoted as "No schooling," "Elementary school," "Middle school," "High school," and "College."[10] It is well documented that the degree of education is positively related with the size of the labor supply (Pencavel 1986). Accumulation of human capital in the form of education will increase wages, raising the opportunity cost of retirement (substitution effect). It should be noted, however, that the

[9]If age is included as a continuous variable, the results do not show much change. Age has a strong negative effect on the odds of labor force participation, and the parameter estimates of other explanatory variables remain practically unchanged.

[10]Each educational category includes both graduates and drop-outs. "College" includes persons who had at least some college education.

variables of education in this study could also capture the effect of income, because no income measure is included in the present analysis. Therefore, the direction of the effect of education will depend on the relative magnitudes of the substitution and income effects.

Variables of the marital status and the family size are included to capture the potential effects of having dependents and receiving family support. A larger family will require a greater household income, but will also have a greater potential for earnings from more family members. Therefore, the sign of the effect of the number of potential earners will depend on the relative sizes of these two different influences. A dummy variable of urban dwelling is included to measure the difference between urban and rural areas. The percentage of the male population aged 60 and older in each city or county is added to capture the effect of the extent of population aging in the locality. Finally, the percentage of the male population aged 50 and older employed in non-agricultural industries is included to show the influence of the local industrial structure.[11]

It should be emphasized that the regression model employed in this study is subject to limitations arising from the cross-sectional nature of the data, as well as the lack of information on a number of key determinants of the labor force participation decisions. First, some of the independent variables may have endogeneity problems. For instance, the family size could reflect outcomes rather than determine the factors of retirement decisions. Second, the retirement effect of job attributes cannot be considered fully in this study because information on the previous occupation and industry is unknown for the retired. Furthermore, the proxy variables employed in the analysis, such as age and education, are highly incomplete measures of labor and non-labor incomes. Some of these shortcomings can be overcome by using the panel data. Unfortunately, such data sources are not available for the years prior to 1997. In spite of these limitations, the results of the regressions given below, if interpreted carefully, should be useful in understanding the reasons for the long-term change in the LFPR of older males since the 1980s.

[11]Agricultural industries include agriculture, forestry, hunting, and fishing.

6. Regression Results

Table 3 presents the results of pooled-sample logistic regressions excluding the cohort dummies. The year dummy variables would capture Korea's various social, economic, and institutional changes, as well as the changing patterns of public policies and social programs such as medical care and pension plans that influenced the labor force participation decisions of older men. By allowing these variables, we can also consider the potential business cycle effect on employment and retirement of older males. Men aged 55 to 74 are included in the analyses. Three regressions are performed separately for men aged 55 to 74 who resided in urban and rural areas, as well as the entire sample of men at the same ages.

< Table 3 here>

Age is negatively related to the odds of labor force participation, as anticipated. The size of the estimated coefficient is similar for all three samples and remained stable over time. The results for the year dummies suggest that, if other variables included in the regressions are held constant, the increasing trend of the LFPR largely disappears for older men residing in rural areas. In contrast, the regression results for city dwellers are remarkably similar to the actual changes in the LFPR presented in Figure 1. This indicates that the independent variables included in the regressions explain better the changes in the LFPR of the rural elderly population than those of older males living in urban areas.

The association between education and labor-market activity of older men was markedly different between rural and urban areas. In urban areas, a strong positive relationship between education and the labor force participation of older males was found. In rural areas, by sharp contrast, males with no schooling were more likely to be in the labor force than the educated. A possible explanation is that formal education was less important in rural areas due to a larger fraction of the self-employed, such as farmers. Alternatively, it could reflect a stronger income effect associated with education in rural areas.

Married men were much more likely to be in the labor force than single men for both the urban and rural populations. The higher labor force participation of the married could have resulted from a greater need to support dependents. Alternatively, it could

reflect a better environment for the labor-market activity of married men owing to the spouses' assistance. On the other hand, the family size was negatively related to the probability of the labor force participation for both rural and urban areas. It appears that the presence of potential earners in the household enabled aged householders to leave the labor force. Additional family members diminished the probability of labor force participation of older men more strongly in rural areas than in cities. This rural-urban difference could be explained by the fact that the relative contribution of other family members to the family economy is much higher in the rural areas than in cities because the proportion of self-employed jobs is higher in the countryside. The observed negative effect of the family size on the probability of labor force participation supports the earlier conjecture that migrations of the rural population to cities should have increased the LFPR of older males in rural areas.

Older men who were residing in rural areas were much more likely to be active in the labor force than city-dwellers. In addition, the percentage of the economically active male population aged 50 and older employed outside agriculture in each city or county had a significant negative effect on the probability of the labor force participation of older males living in the locality. These results suggest that urbanization and the decline of agriculture in Korea, other things being equal, would have greatly lowered the LFPR of older males, as in the case in nineteenth- and early-twentieth-century America (Lee 2002).[12] Finally, the percentage of the male population aged 60 and older in each city or county, an indicator of the degree of population aging in the locality, stands out as a very powerful predictor of the labor force participation of older males. Its effect on the odds of labor force participation is strongly positive for both the rural and urban populations. The magnitude of the effect, however, was greater in the

[12]The changing composition of business may have been an additional force that decreased the LFPR of older men. Among the men aged 55 to 74 in the labor force, the percentage of self-employed farmers declined from 66.6 percent in 1980 to 43.4 percent in 1995, while the fraction of wage and salary workers increased from 12.3 percent in 1980 to 35.1 percent in 1995. The percentage of non-farm self-employed slightly fell from 21.1 percent to 20.7 percent over the 15 years. Between 1995 and 2000, the percentage of non-farm self-employees increased to 25.1 percent while the share of wage and salary workers remained stable. Since the hazard rate of retirement had been much lower for self-employed farmers than the other types of jobs during the period 1980-2000 (Lee 2004), such changes in the composition of employment should have decreased the LFPR of older men.

rural than in urban areas, consistent with the hypothesis that the population aging in rural areas caused by rural-urban migration increased the LFPR of older men in countryside.[13]

The above results suggest that losing family labor in rural households owing to rural-urban migrations was a major cause of the rise of the LFPR of older males between 1980 and 1997. The changing age structure, urbanization, and the relative decline of agriculture were all countervailing forces that decreased the labor-market activity of older men over the two decades under study. Improved educational attainments should have increased the labor force participation of older men in cities, and should have decreased the economic activity of aged men in rural areas. On the other hand, the decrease in the family size and population aging in each county or city should have increased the LFPR of older men, especially of those living in rural areas.

The effect of population aging in rural areas was particularly large in magnitude. A one-percent increase in the proportion of the male population aged 60 and older was associated with a 5.4-percent rise in the probability of the labor force participation in rural areas. Since the average share of the population aged 60 and older in rural areas increased by 8.8 percentage points between 1980 and 1995, this change would have produced a 48-percent increase in the LFPR of older males during the 15 years, more than seven times the actual rise in the LFPR of males aged 55 to 74 in rural areas.[14] For

[13]Migration from urban to rural areas might itself be related to retirement if many older urban dwellers chose to relocate in the countryside after leaving the labor market. In contrast, in the case of the early-twentieth-century United States (Moen 1994), older farmers could move to towns or cities after retirement. These possibilities were tested by including the dummy variables of migration across rural and urban areas during the 5-year period prior to the census year instead of the urban dwelling dummy variable. Both urban-to-rural and rural-to-urban migrants were less likely to participate in the labor market than non-migrants, indicating that the migration of older men was related to retirement decisions. However, since the percentage of migrants across rural and urban areas was very small (2.5 percent) and migrations in both directions are positively related to the probability of retirement, the observed migration-retirement link among older men does not explain the effects of urban dwelling and population aging on the probability of labor force participation as reported in the regression results.

[14]The strong effect of the extent of population aging on the labor force participation of older males is also observed for the period from 1970 through 1980. The published Census Reports for 1970, 1975, and 1980 provide statistics on the age-specific population and labor force participation rate separately for Dong, Eup, and Myon for the nine provinces (*Do*) and for the entire areas of the cities of Seoul and Pusan. Regressions were conducted using the 87 observations (29 places for three years) obtained from these sources. The results, not presented here, indicate that a one-percent increase in the share of the male population 60 and older was

the entire sample, the rise in the elderly population in each locality between 1980 and 1995 (3.5 percentage points) would have resulted in a 16-percent increase in the LFPR of older men, more than twice the actual rise in the LFPR of all males aged 55 to 74.

<Table 4 here>

Table 4 presents the results for the regressions including those of the cohort dummies and normalized year dummies. "Dummy 1990," for instance, denotes d_3^* in equation (8). Since the geographic mobility of older men across urban and rural areas was very low during the period under study, it is reasonable to construct synthetic birth cohorts and perform the regression analysis separately for the urban and rural populations.[15] The estimated coefficients of the cohort dummies suggest that, starting from the cohorts born between 1931 and 1935; later cohorts were generally less likely to participate in the labor market than earlier cohorts. The year effects shown in the coefficients of the normalized year dummies are generally similar to those of the previous regressions excluding cohort dummies (see Table 3). For the entire sample, the year effects for 1980 and 1985 recovered from the two restrictions are -0.073 and 0.059, respectively. The coefficients for the modified year dummies suggest that there was a strong transitory shock that increased the LFPR of older men in 1995.

The regression results for the variables of age, education, marital status, family size, urban dwelling, the percentage of the population engaged in non-agricultural work, and the percentage of males 60 and older are generally similar to those of the previous regressions reported in Table 3. Even if the age and cohort effects, as well as the transitory time effect are considered, the aging of the population in each city or county emerges as the single most powerful factor explaining the increase in the LFPR of older men between 1980 and 1995.

<Table 5 here>

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associated with a 2 to 3.5 percent rise in the LFPR of males aged 60 and older, depending on the inclusion of other control variables such as the dummy variables of Dong, Eup, and Myon, for province and city, as well as the year dummy variable. The share of the elderly population variable alone explains 75 percent of the variation in the LFPR of older males across places and times, and accounts for more than 100 percent of the change in the participation rate between 1970 and 1980.

[15] Each Census provides information on the previous place of residence. Only 2.5 percent of men aged 55 to 74 in the pooled sample of the five Censuses had migrated across urban and rural areas during the five years prior to each census year.

<Table 6 here>

Similar regressions were performed separately for each year and for the rural and urban areas, excluding the cohort and year dummies to see how the effect of each independent variable changed over time. The results are reported in Tables 5 (rural areas) and 6 (urban areas). A notable difference found across years is that the effect of education, especially that of college education on the labor force participation of the urban elderly population diminished over time (Table 6). The estimated coefficient for college education was particularly small in 2000. This perhaps resulted from the fact that many aged white-collar workers were forced to retire on the basis of their age in the course of the restructuring of firms after the financial crisis and that a large fraction of these workers were college graduates.

Another notable result is that the effect of population aging in the locality on the probability of labor force participation has been diminishing in magnitude over time in both rural and urban areas. Moreover, the negative effect of the family size on the probability of remaining active in the labor market became weaker over time. Its sign even turned positive for the urban sample from 1990 to 2000. As noted above, these two variables are perhaps the major forces that produced the increase in the LFPR of older men from 1980 to 1995, which dominated the countervailing influences of urbanization and agricultural decline. Thus, if the effects of these two variables diminish in the long-run, as the regression results suggest, the LFPR of older men is likely to fall over time, other things being equal.

7. Discussions

The results of the previous sections suggest that the rise in the LFPR of aged Korean males over the last four decades was largely produced by the dramatic increase in the labor-market activity of older men residing in rural areas. This study also indicates that the population aging produced by the mass-migration of younger persons to urban areas was a major explanation for the increase in the LFPR of the rural elderly population. Although it is not entirely clear why the increase in the share of the elderly population in a county was related to a higher LFPR of older men in the locality, circumstantial evidence suggests that older householders are forced to continue to work

because they are losing family labor.

<Table 7 here>

The average size of farm households decreased from 6.4 persons in 1963 to 2.8 persons in 2006 (Table 7). According to Kim et al. (1997), the households in Myon-areas today have less than three persons on the average. It is particularly notable that the numbers of one-generation households and single-person households rapidly increased. In 1960, the majority of rural households were composed of two or three generations. The proportion of one-generation households in Myon-areas increased from 4.4 percent in 1960 to 27.5 percent by 1995. The majority of the heads of these one-generation households are older persons. In 1995, for instance, 78 percent of the heads of the one-generation households were aged 55 or older. Similarly, the share of single-person households sharply increased from 2 percent in 1960 to 17 percent in 1995. Again, the majority of the single-person householders were aged 55 and older.

An intriguing question related to the rising LFPR of the rural elderly population is why the Korean case is so different from the historical experiences of other developed nations that also went through a large-scale population movement from rural to urban areas that would have accelerated the pace of the population aging in countryside. In early-twentieth-century America, as in the case of Korea, farmers remained in the labor force longer than non-farmers owing to the greater flexibility of farming. However, the pace of the decline in the LFPR of older males in the U.S. was not greatly different between farmers and non-farmers from 1880 to 1940 (Lee 2002). It was quite common for an older farmer to sell his farm, move to a nearby town, and lead a relatively independent retirement (Moen 1994, Lee 1999).

Further investigation is needed to understand why so many older farmers in Korea do not follow the retirement pattern seen in the past among American farmers. A possible explanation is that the relative decline of the rural economy in the course of industrialization made it increasingly difficult for the rural elderly population to save for retirement. The ratio of the income of farm households to the income of urban households shows a long-term decreasing trend (Table 7). Except for the late 1960s, when the average income of urban households rose rapidly, farm households fared relatively well until the mid-1980s. Beginning in the late 1980s, farm households began

to lose ground, and they currently receive 78 percent of the income earned by urban households. According to the 1996 National Survey of Family Income and Expenditure, the average amount of net savings of rural households was only 76 percent of the net wealth held by urban households (Korean National Statistical Office 2000, 3-13). The result of the 1994 Social Statistics Survey indicates that the people living in rural areas are much less prepared financially for old-age security than city-dwellers. While 57 percent of urban respondents had made preparations for old age, only 41 percent of rural respondents had done so (Korean National Statistical Office 2000, 3-13).

Statistics on wealth holdings suggest that it is probably difficult for the majority of older farmers to finance retirement by selling their farm properties. In 1995, for instance, the average value of wealth held by farm households was 150 million Won, about 10 times the average farm household expenditure (Korea National Statistical Office 1995b). Since the wealth distribution in rural areas is highly skewed, the median value of wealth possessed by farm households should be much lower than the average.

If older males in rural areas tend to stay in the labor force longer involuntarily because of insufficient savings, a rise in the value of farm properties would stimulate retirement of the rural elderly population. Thus, the effect of the rate of appreciation of land value between 1985 and 1990 in each city or county on the probability of labor force participation of older men who resided in the locality was examined. For this particular analysis, the five-year period was selected because it was the only time interval between two census years prior to 1997 during which the LFPR of older men in rural areas declined and the average land price rapidly rose. The results of the logit regressions (not reported here), which employed a model similar to one used in the previous regressions (Tables 3 and 4), show that the rate of change of the average land value between 1986 and 1990 had a strong negative effect on the probability of labor force participation of older males, especially those living in rural areas.[16]

It is noted above that the sharp decline in the LFPR of older males between 1995 and 2000 may have resulted from the deterioration of the labor-market conditions after the financial crisis. To see if retirement decisions of older men in Korea were

[16]A one-percent increase in the average land value was associated with a 0.4-percent decrease in the probability of labor force participation of older men in rural areas. The magnitude of the effect for the urban population was only a quarter of the magnitude for the rural population.

actually influenced by business cycles, additional pooled-sample logistic regressions similar to those reported in Table 3 were conducted. In this case, a variable pertaining to labor-market nonparticipation of prime-age males (ages 25 to 49) in each city or county of residence was added. For the purpose of the present analysis, men who did not work involuntarily were defined as nonparticipants. The 2005 census was not included in the pooled sample, because it does not provide reasons for not working. The results are reported in Table 8.

<Table 8 here>

The results confirm the conjecture that poor labor-market conditions may have pushed older male workers out of the labor force. As a whole, the one-percent increase in the nonparticipation rate among prime-age males was associated with three-percent decline in the LFPR of males aged 55 to 74. Between 1995 and 2000, the average nonparticipation rate of males aged 25 to 49 in the pooled sample of the Censuses rose from 8.4 percent to 13.1 percent. If the regression result is applied, the sliding job-market conditions would have decreased the LFPR of older men by 14 percent. This suggests that the surge in unemployment following the financial crisis should be a major culprit of the exodus of older workers from the labor market after 1998.

<Table 9 here>

Another possible explanation for the increase in the LFPR of older males in rural areas is the technological progress in agricultural production that may have allowed aging farmers to continue working. It appears that farmers increasingly adopted more technology- and capital-intensive production methods to overcome the growing labor shortage in rural areas (Koo 1991). Table 9 reports the number of the five major agricultural machines, namely, scuffler, tractor, rice transplanter, binder, and combine. The numbers are presented as fractions of the total number of farm households from 1980 through 2005. It is apparent from the table that Korean agriculture became increasingly mechanized since 1980.

To see if such technological changes in the agricultural sector increased the LFPR of older men in rural areas by diminishing their required work efforts, logistic regressions similar to those presented in Table 5 were performed. The number of agricultural machines per farm household in each county of residence in the set of

independent variables was included in the computation. Since the county-level statistics on farm machines are available only for the recent period, the regression analysis is confined to a sample from the 2005 census. The sample is further limited to 16,236 males aged 55 to 74 living in rural areas. The variables regarding the five major farm machines were included in the regressions one by one. Table 10 presents the estimated partial effects of the variables pertaining to farm machines, omitting the results for other independent variables that were included in the regressions.

<Table 10 here>

The results suggest that technological progress may have encouraged the economic activity of older farmers in Korea. The probability of labor force participation of older males was higher in counties where scufflers, rice transplanters, and combines were more widely used. However, these relationships obtained from cross-sectional regressions do not tell the direction of the causality. It may have been a case where the growing aging population and labor shortage in rural areas produced both the increasing adoptions of farm machines and the rise of the LFPR of older farmers.

The rise of the economic activity of older males in rural areas may not be fully explained by the economic factors considered above. Older farmers could continue to work while living on the farm because they are emotionally attached to their life-long job, place of residence, and neighbors (Lee 1993a, Koo 1991). Yoon (1984) reported that aged farmers stayed on the farm because the economic difficulties of their children or relatives living in urban areas made co-residency difficult. Moreover, they hoped to serve as a safety net for their migrant children. According to a survey conducted in 1983, migrant children received remittances from their parents twice as much as the amount they sent home on the average (Lee 1993b). It is also possible that some practically retired farmers are regarded as participants by maintaining some minor works while living in farm households. The economic and demographic changes explained above, such as the large-scale city-bound migrations and relative decline of the rural economy may have increased the number of such marginal participants among the elderly in rural areas. Other non-economic factors not considered here, such as the changing attitudes towards work and improving health conditions, could have produced the same outcome.

8. Conclusions

This paper has estimated the labor force participation rate (LFPR) of older males in Korea from 1955 to 2005 and analyzed the effects of several determining factors of the labor force participation decisions at older ages. The most remarkable result is the increase from 40-44 percent in 1965 to 53-55 percent in 1995 of the LFPR of older males aged 60 and older. This pattern is sharply distinct from the historical experiences of most OECD countries that witnessed a rapid decline in the labor force participation of older males over the last century. Although not highly reliable, the estimate from the early Census data indicates that the LFPR of older men fell from 1955 to the mid-1960s before it began to increase. The LFPR of older males fell dramatically after 1997, presumably due to the adverse labor-market effect of the financial crisis.

The rise in the LFPR of older males in Korea between 1965 and 1995 is largely explained by the dramatic increase in the labor-market activity among the rural elderly population. The LFPR of men aged 60 and older living in the rural areas increased from 46 to 70 percent during the same period, in sharp contrast to the 4 percentage-point rise among urban-dwellers. The results of the regression analyses suggest that the acceleration of population aging in rural areas due to the selective out-migration of younger persons was the major cause of the sharp increase in the LFPR of older males. It is likely that the relative decline of the rural economy in the course of industrialization made it increasingly difficult for the rural elderly population to save for retirement.

The results of this analysis suggest that the evolution of the labor market activity of older males in emerging economies may not be the same as the historical experiences of developed countries. In Korea, for instance, the pattern of the labor market activity of older men is distinct from that of the more developed countries in several respects. First, the overall LFPR of older males is much higher than those in other OECD countries. The relatively high participation rate may be attributable to the greater proportion of the self-employed among the elderly, as well as the late development of a public old-age pension program in Korea. Second, the trend of the LFPR of older males in Korea exhibits substantial fluctuations over time. This instability in the economic activity of older men is presumably due to the highly fragile labor-market status of older workers

in Korea that makes them vulnerable to recessions or structural changes in the economy.[17] Finally, as this paper found out, the LFPR of aged males in Korea shows a long-term upward trend until 1997. As suggested above, this is likely to be an outcome of the relative decline of the rural economy in Korea. In sum, the features of the long-term trend of the *labor* market activity of older men in Korea reflect the characteristics of the social welfare system, labor market structure, and the legacy of past development strategy.

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Table 1
Population Share and Labor Force Participation Rate of Males Aged 50 and Older by Age Group

Year	Population Share					Labor-Force Participation Rate							
	50-54	55-59	60-64	65-69	70+	50-54	55-59	60-64	65-69	70+	50-59	50+	60+
1955	0.293	0.257	0.189	0.136	0.126	0.933	0.897	0.803	0.683	0.464	0.916	0.785	0.672
1960	0.324	0.224	0.181	0.129	0.142	0.899	0.873	0.711	0.507	0.291	0.889	0.718	0.521
1965	0.320	0.254	0.172	0.124	0.131	0.916	0.851	0.636	0.432	0.178	0.887	0.701	0.436
1970	0.314	0.253	0.187	0.112	0.134	0.919	0.854	0.676	0.494	0.230	0.890	0.717	0.491
1975	0.320	0.245	0.182	0.126	0.127	0.937	0.856	0.638	0.487	0.203	0.902	0.726	0.486
1980	0.298	0.255	0.179	0.128	0.140	0.851	0.764	0.654	0.510	0.253	0.811	0.667	0.487
1985	0.327	0.228	0.181	0.123	0.140	0.917	0.815	0.679	0.531	0.285	0.875	0.715	0.514
1990	0.326	0.247	0.162	0.122	0.143	0.911	0.817	0.642	0.494	0.263	0.871	0.701	0.473
1995	0.282	0.253	0.191	0.116	0.156	0.930	0.853	0.698	0.525	0.315	0.894	0.723	0.525
2000	0.273	0.225	0.197	0.142	0.163	0.830	0.719	0.581	0.467	0.293	0.779	0.617	0.455
2005	0.257	0.210	0.173	0.155	0.206	0.839	0.743	0.590	0.500	0.337	0.796	0.620	0.466

Sources: Published Population and Housing Census Reports for 1955-1975; Micro samples of Population and Housing Census for 1980-2005.

Table 2
Urban Population Share and Labor-Force Participation Rate of Males Aged 60 and Older by Place of Residence

Year	Share of Urban Dwellers				Labor Force Participation Rate							
	60+	60-64	65-69	70+	60+		60-64		65-69		70+	
					Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural
1960	0.172	0.200	0.164	0.143	0.373	0.551	0.485	0.767	0.350	0.543	0.197	0.306
1965	0.206	0.235	0.199	0.174	0.351	0.458	0.491	0.680	0.317	0.461	0.142	0.185
1970	0.247	0.281	0.245	0.200	0.353	0.536	0.483	0.751	0.310	0.554	0.140	0.252
1975	0.304	0.336	0.312	0.252	0.337	0.551	0.487	0.782	0.288	0.578	0.110	0.235
1980	0.360	0.385	0.368	0.322	0.281	0.603	0.400	0.812	0.253	0.660	0.127	0.313
1985	0.436	0.470	0.439	0.389	0.333	0.654	0.481	0.853	0.305	0.708	0.128	0.386
1990	0.467	0.500	0.470	0.427	0.325	0.603	0.493	0.790	0.303	0.663	0.122	0.369
1995	0.571	0.606	0.574	0.525	0.391	0.703	0.588	0.868	0.348	0.762	0.149	0.498
2000	0.605	0.659	0.596	0.547	0.312	0.675	0.463	0.809	0.278	0.746	0.124	0.498
2005	0.566	0.659	0.562	0.493	0.311	0.668	0.483	0.795	0.302	0.754	0.136	0.541

Sources: Published Population and Housing Census Reports for 1955-1975; Micro samples of Population and Housing Census for 1980-2005.

Table 3
Results of Pooled-Sample Logistic Regressions:
Correlates of the Probability of Labor-Force Participation for Males Aged 55 to 74

	All		Rural		Urban	
	Mean	∂P / ∂X	Mean	∂P / ∂X	Mean	∂P / ∂X
Ages 60 to 64	0.285	-0.586 **	0.284	-0.533 **	0.286	-0.597 **
Ages 65 to 69	0.211	-0.787 **	0.226	-0.754 **	0.202	-0.799 **
Ages 70 to 74	0.137	-0.886 **	0.155	-0.879 **	0.126	-0.887 **
Year 1985	0.145	0.147 **	0.222	-0.013	0.098	0.377 **
Year 1990	0.135	0.096 **	0.203	-0.071 *	0.094	0.408 **
Year 1995	0.169	0.480 **	0.130	-0.086 *	0.193	0.990 **
Year 2000	0.198	0.013	0.137	-0.061 *	0.235	0.226 **
Year 2005	0.254	0.227 **	0.153	0.154 **	0.317	0.447 **
Elementary School	0.339	-0.022	0.421	-0.051 **	0.288	0.155 **
Middle School	0.163	-0.100 **	0.121	-0.361 **	0.190	0.213 **
High School	0.190	-0.096 **	0.100	-0.466 **	0.246	0.237 **
College	0.131	0.120 **	0.051	-0.437 **	0.181	0.537 **
Married	0.916	1.446 **	0.921	2.352 **	0.913	0.991 **
Family size	3.497	-0.043 **	3.626	-0.076 **	3.417	-0.017 **
Urban dwelling	0.617	-0.276 **	0.000	NI	1.000	NI
% Agriculture	45.294	0.013 **	80.494	0.013 **	23.476	0.013 **
% Male 60+	7.674	0.045 **	10.933	0.054 **	5.655	0.044 **
N of observations	276,238		105,848		170,390	

Note: Significance level + 10%, * 5%, ** 1%. NI stands for “Not Included.” Omitted categories are: (1) ages 55 to 59, (2) year 1980, and (3) no schooling.

Table 4
Results of Logistic Regressions for Synthetic Cohort Analyses:
Correlates of the Probability of Labor-Force Participation for Males Aged 55 to 74

	All		Rural		Urban	
	Mean	∂P / ∂X	Mean	∂P / ∂X	Mean	∂P / ∂X
Ages 60 to 64	0.285	-0.596 **	0.284	-0.555 **	0.286	-0.598 **
Ages 65 to 69	0.211	-0.796 **	0.226	-0.768 **	0.202	-0.799 **
Ages 70 to 74	0.137	-0.886 **	0.155	-0.877 **	0.126	-0.889 **
Cohort 1911-15	0.038	0.152 **	0.063	0.359 **	0.022	-0.121
Cohort 1916-20	0.074	0.220 **	0.119	0.564 **	0.046	-0.071
Cohort 1921-25	0.131	0.175 **	0.186	0.716 **	0.097	-0.110
Cohort 1926-30	0.146	0.323 **	0.179	0.900 **	0.126	0.039
Cohort 1931-35	0.191	0.516 **	0.185	1.099 **	0.195	0.226 *
Cohort 1936-40	0.187	0.463 **	0.132	0.743 **	0.222	0.251 **
Cohort 1941-45	0.137	0.214 **	0.077	0.189 *	0.174	0.099
Cohort 1946-50	0.083	0.200 **	0.037	-0.099	0.111	0.093
Dummy 1990	-0.057	-0.070 **	-0.085	-0.144 **	-0.039	0.013
Dummy 1995	-0.070	0.193 **	-0.225	-0.173 **	0.026	0.339 **
Dummy 2000	-0.088	-0.165 **	-0.285	-0.092 **	0.034	-0.192 **
Dummy 2005	-0.079	0.056 **	-0.336	0.272 **	0.081	-0.030 **
Elementary School	0.339	-0.049 **	0.421	-0.095 **	0.288	0.136 **
Middle School	0.163	-0.122 **	0.121	-0.371 **	0.190	0.195 **
High School	0.190	-0.119 **	0.100	-0.475 **	0.246	0.213 **
College	0.131	0.087 **	0.051	-0.456 **	0.181	0.504 **
Married	0.916	1.424 **	0.921	2.290 **	0.913	0.978 **
Family size	3.497	-0.042 **	3.626	-0.076 **	3.417	-0.016 **
Urban dwelling	0.617	0.281 **	0.000	NI	1.000	NI
% Agriculture	45.294	0.013 **	80.494	0.013 **	23.476	0.013 **
% Male 60+	7.674	0.045 **	10.933	0.053 **	5.655	0.044 **
N of observations	276,238		105,848		170,390	

Note: Significance level + 10%, * 5%, ** 1%. NI stands for "Not Included." Omitted categories are: (1) ages 55 to 59, (2) cohort 1906-10, (3) year 1980, and (4) no schooling.

Table 5
Results of Logistic Regressions for Each Year: Males in Rural Areas Aged 55 to 74 (∂P/∂X)

	1980	1985	1990	1995	2000	2005
Ages 60 to 64	-0.565 **	-0.593 **	-0.606 **	-0.562 **	-0.373 **	-0369 **
Ages 65 to 69	-0.813 **	-0.823 **	-0.810 **	-0.795 **	-0.558 **	-0.532 **
Ages 70 to 74	-0.931 **	-0.921 **	-0.909 **	-0.893 **	-0.770 **	-0.712 **
Elementary	-0.145 **	-0.173 **	-0.065 +	-0.015 +	0.006 +	0.192 **
Middle School	-0.488 **	-0.523 **	-0.319 **	-0.340 **	-0.362 **	0.038 **
High School	-0.361 **	-0.575 **	-0.359 **	-0.463 **	-0.475 **	-0.291 **
College	-0.230 +	-0.502 **	-0.111 +	-0.416 **	-0.549 **	-0.389 **
Married	2.004 **	2.803 **	1.855 **	2.258 **	1.996 **	2.593 **
Family size	-0.144 **	-0.130 **	0.014 +	-0.009 +	-0.001 +	-0.067 **
% Agriculture	0.037 **	0.023 **	0.006 **	0.022 **	0.019 **	0.022 **
% Male 60+	0.027 +	0.053 **	0.123 **	0.031 **	0.006 +	0.032 **
N of observations	16,389	23,463	21,492	13,760	14,511	16,233

Note: Significance level + 10%, * 5%, ** 1%. NI stands for "Not Included." Omitted categories are: (1) ages 55 to 59, and (2) no schooling.

Table 6
Results of Logistic Regressions for Each Year: Males in Urban Areas Aged 55 to 74 (∂P/∂X)

	1980	1985	1990	1995	2000	2005
Ages 60 to 64	-0.503 **	-0.590 **	-0.665 **	-0.66 **	-0.552 **	-0.595 **
Ages 65 to 69	-0.742 **	-0.791 **	-0.843 **	-0.857 **	-0.768 **	-0.787 **
Ages 70 to 74	-0.847 **	-0.907 **	-0.922 **	-0.924 **	-0.862 **	-0.876 **
Elementary	0.261 **	0.141 *	0.132 +	-0.078 +	0.032 +	0.261 **
Middle School	0.480 **	0.360 **	0.303 **	-0.091 +	0.058 +	0.210 **
High School	0.824 **	0.569 **	0.681 **	-0.010 +	-0.052 +	0.188 **
College	2.134 **	1.343 **	1.708 **	0.304 **	0.092 +	0.325 **
Married	1.002 **	1.090 **	0.735 **	0.891 **	1.056 **	1.063 **
Family size	-0.045 **	-0.037 **	0.008 +	0.010 +	0.008 +	-0.020 **
% Agriculture	0.012 **	0.010 **	0.004 **	0.013 **	0.013 **	0.014 **
% Male 60+	0.443 **	0.176 **	0.107 **	0.021 **	0.016 **	0.057 **
N of observations	10,813	16,700	15,934	32,862	40,116	53,965

Note: Significance level + 10%, * 5%, ** 1%. NI stands for "Not Included." Omitted categories are: (1) ages 55 to 59, and (2) no schooling.

Table 7
Average Size and Income of Farm and Urban Households in Korea, 1963-2006

Year	Household size			Household Income (Won)		
	Farm	Urban	Ratio	Farm	Urban	Ratio
1963	6.39	5.56	1.15	7,765	5,990	1.30
1964	6.44	5.56	1.16	10,474	7,320	1.43
1965	6.29	5.56	1.13	9,350	8,450	1.11
1966	6.22	5.56	1.12	10,848	11,750	0.92
1967	6.12	5.85	1.05	12,456	18,180	0.69
1968	6.02	5.70	1.06	14,913	21,270	0.70
1969	5.99	5.53	1.08	18,156	24,650	0.74
1970	5.92	5.48	1.08	21,317	28,180	0.76
1971	5.83	5.40	1.08	29,699	33,340	0.89
1972	5.71	5.37	1.06	35,783	38,080	0.94
1973	5.72	5.26	1.09	40,059	40,380	0.99
1974	5.66	5.22	1.08	56,204	47,780	1.18
1975	5.63	5.18	1.09	72,744	65,540	1.11
1976	5.54	5.12	1.08	96,355	88,270	1.09
1977	5.52	4.83	1.14	119,401	105,910	1.13
1978	5.38	4.73	1.14	157,016	144,510	1.09
1979	5.20	4.66	1.12	185,624	194,749	0.95
1980	5.11	4.58	1.12	224,426	234,086	0.96
1981	5.05	4.56	1.11	307,321	280,953	1.09
1982	4.97	4.45	1.12	372,098	313,608	1.19
1983	4.99	4.37	1.14	427,354	359,041	1.19
1984	4.80	4.28	1.12	462,428	395,613	1.17
1985	4.70	4.21	1.12	478,021	423,788	1.13
1986	4.52	4.16	1.09	499,584	473,553	1.05
1987	4.33	4.08	1.06	544,610	553,099	0.98
1988	4.28	4.04	1.06	677,468	646,672	1.05
1989	4.12	4.02	1.02	786,389	804,938	0.98
1990	3.97	3.99	0.99	918,815	943,272	0.97
1991	3.82	3.97	0.96	1,092,087	1,158,608	0.94
1992	3.70	3.92	0.94	1,208,788	1,356,110	0.89
1993	3.78	3.84	0.98	1,410,664	1,477,828	0.95
1994	3.68	3.76	0.98	1,692,980	1,701,304	1.00
1995	3.56	3.73	0.95	1,816,880	1,911,064	0.95
1996	3.46	3.67	0.94	1,941,472	2,152,687	0.90
1997	3.39	3.63	0.93	1,957,363	2,287,335	0.86
1998	3.29	3.62	0.91	1,707,811	2,133,115	0.80
1999	3.23	3.59	0.90	1,860,246	2,224,743	0.84
2000	3.12	3.54	0.88	1,922,677	2,386,947	0.81
2001	3.05	3.49	0.87	1,992,231	2,625,118	0.76
2002	2.97	3.44	0.86	2,039,552	2,792,400	0.73
2003	2.96	3.45	0.86	2,239,799	2,940,026	0.76
2004	2.85	3.39	0.84	2,416,711	3,113,362	0.78
2005	2.83	3.35	0.84	2,541,918	3,250,837	0.78
2006	2.77	3.31	0.84	2,691,957	3,443,399	0.78

Source: Urban Household Income Survey, Farm Household Economic Statistics.

Table 8
Results of 1980-2000 Pooled-Sample Logistic Regressions:
Local Labor-Market Condition and the Probability of Labor-Force Participation for Males Aged 55 to 74

	All		Rural		Urban	
	Mean	∂P / ∂X	Mean	∂P / ∂X	Mean	∂P / ∂X
Ages 60 to 64	0.291	-0.601 **	0.291	-0.550 **	0.291	-0.610 **
Ages 65 to 69	0.202	-0.808 **	0.218	-0.788 **	0.191	-0.815 **
Ages 70 to 74	0.127	-0.905 **	0.146	-0.905 **	0.114	-0.902 **
Year 1985	0.195	0.299 **	0.266	0.215	0.149	0.407 **
Year 1990	0.182	0.179 **	0.230	0.113 *	0.150	0.367 **
Year 1995	0.226	0.548 **	0.146	1.049	0.278	0.931 **
Year 2000	0.265	0.179 **	0.155	1.300 **	0.336	0.255 **
Elementary School	0.356	0.007	0.428	-0.012 **	0.310	0.131 **
Middle School	0.153	0.027	0.096	-0.297 **	0.189	0.291 **
High School	0.161	0.076 **	0.073	-0.388 **	0.218	0.369 **
College	0.118	0.439 **	0.034	-0.342 **	0.171	0.838 **
Married	0.920	1.530 **	0.922	2.563 **	0.918	0.966 **
Family size	3.876	-0.073 **	3.809	-0.135 **	3.920	-0.032 **
Urban dwelling	0.608	-0.203 **	0.000	NI	1.000	NI
% Agriculture	43.527	0.014 **	81.082	0.015 **	19.414	0.014 **
% Male 60+	7.361	0.051 **	10.234	0.056 **	5.516	0.047 **
% Non-participation	9.793	-0.030 **	7.272	0.039 **	11.415	-0.016 **
N of observations	206,040		80,676		125,364	

Note: Significance level + 10%, * 5%, ** 1%. NI stands for “Not Included.” Omitted categories are: (1) ages 55 to 59, (2) year 1980, and (3) no schooling.

Table 9
Number of Agricultural Machines per Farm Household from 1980 to 2005

Agricultural machines	1980	1985	1990	1995	2000	2005
Scuffler	0.134	0.306	0.425	0.579	0.679	0.844
Tractor	0.001	0.006	0.023	0.067	0.136	0.179
Rice Transplanter	0.005	0.022	0.078	0.165	0.247	0.261
Binder	0.006	0.013	0.031	0.045	0.052	0.047
Combine	0.001	0.006	0.025	0.048	0.063	0.068

Source: Korea National Statistical Office, Korea Statistical Information Service (http://www.kosis.kr).

Table 10
Summary of Results of Five Logistic Regressions based on the 2005 Census:
Diffusion of Agricultural Machines and the Probability of Labor-Force Participation of Older Men

	Mean	$\partial P / \partial X$	P-value
1. Scufflers per farm household	0.746	0.417	0.0712
2. Tractors per farm household	0.196	0.008	0.9813
3. Rise Transplanters per farm household	0.295	0.472	0.0866
4. Binders per farm household	0.055	0.029	0.9138
5. Combines per farm household	0.076	8.984	0.0028

Note: Similar independent variables as those used in the regressions reported in Table 5 are used in these regressions but they are omitted from this table. The sample used for regressions is limited to the 16,236 males aged 55 to 74 living in rural areas in 2005. Dependent variable has a value of one if a man works, and zero, otherwise.

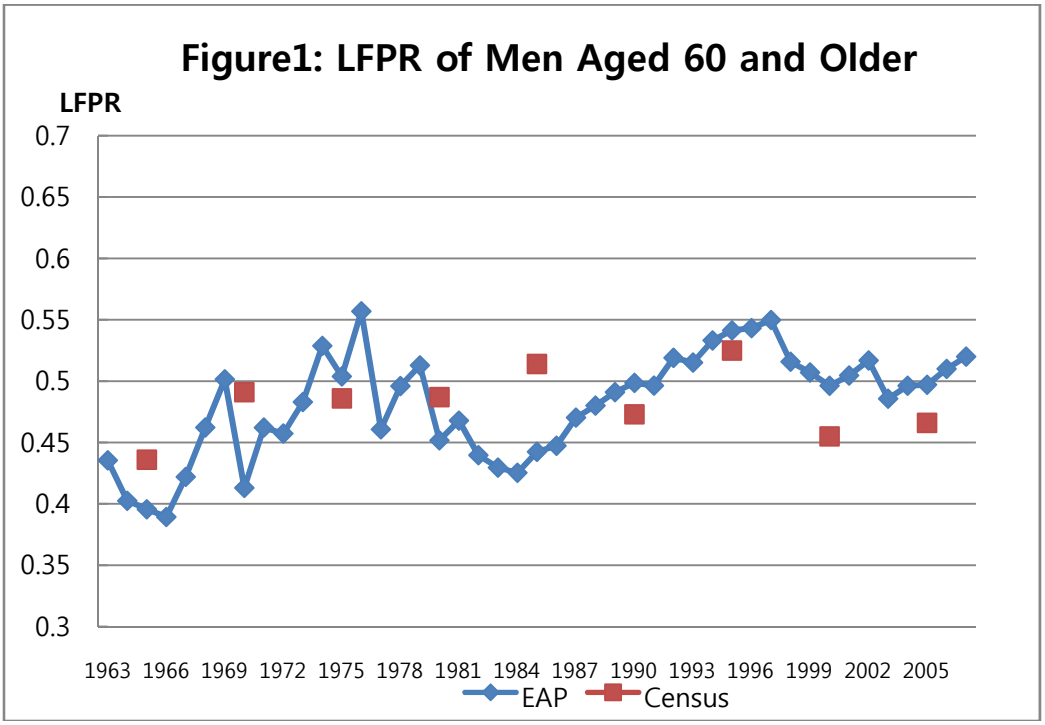
Figure1: LFPR of Men Aged 60 and Older
LFPR
0.7
0.65
0.6
0.55
0.5
0.45
0.4
0.35
0.3
1963 1966 1969 1972 1975 1978 1981 1984 1987 1990 1993 1996 1999 2002 2005
EAP
Census

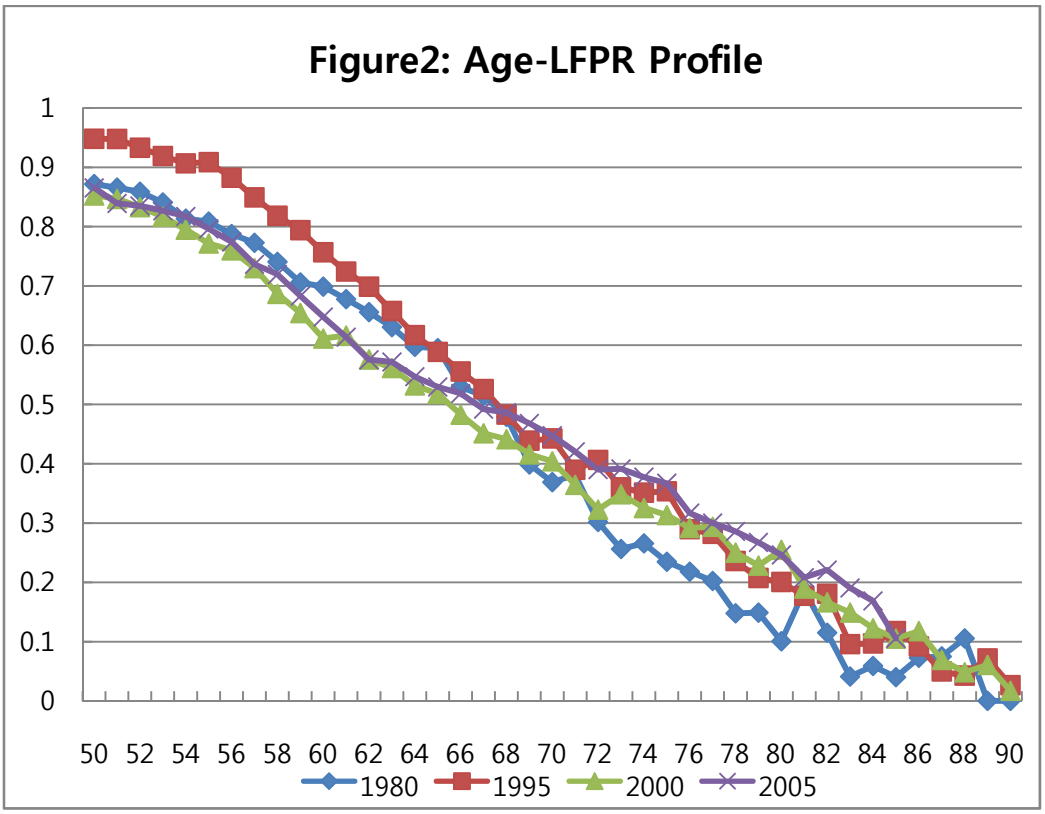
Figure2: Age-LFPR Profile
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
50 52 54 56 58 60 62 64 66 68 70 72 74 76 78 80 82 84 86 88 90
1980
1995
2000
2005

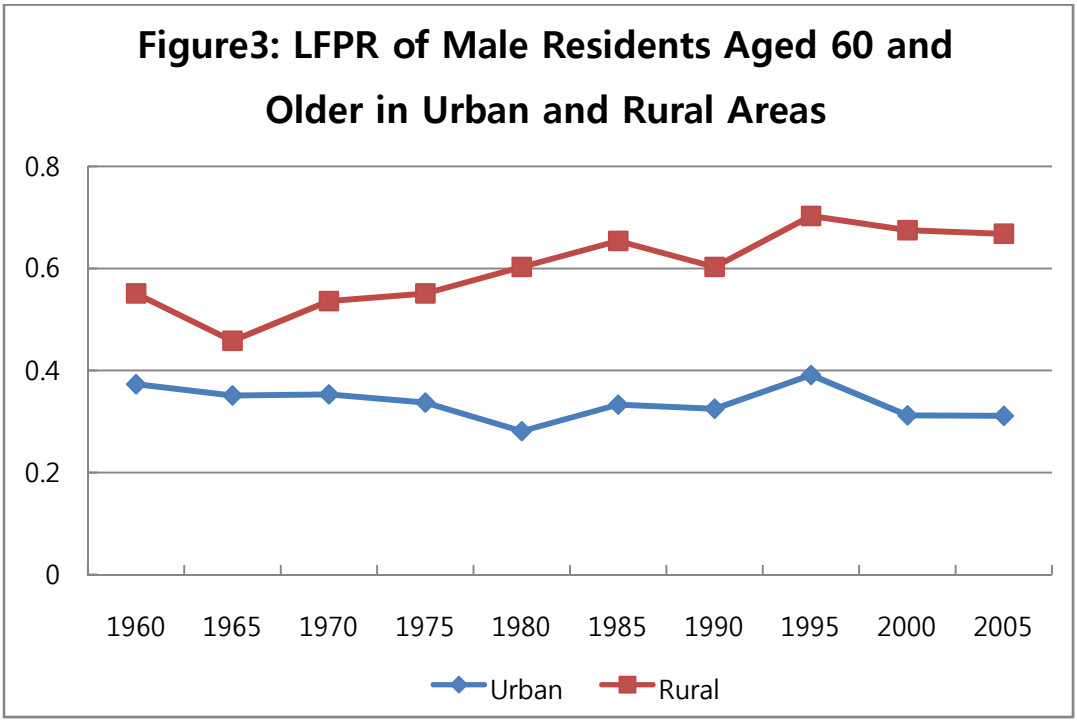
Figure3: LFPR of Male Residents Aged 60 and Older in Urban and Rural Areas
0.8
0.6
0.4
0.2
0
1960
1965
1970
1975
1980
1985
1990
1995
2000
2005
Urban
Rural