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Health Capacity to Work at Older Ages in South Korea: Estimates and Implications for Public Pension Policies†

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Health capacity to work for the elderly is an essential piece of information for designing social policies in an aging society. Here, we assess the health capacity to work of older men in South Korea and provide a cross-country comparison. Following the methodology proposed by Milligan and Wise (2012), which uses the cohort mortality rate as a proxy for overall health status, we quantify the additional employment capacity of current older men in reference to the mortality-employment relationship of a generation ago. Despite the high employment rate of older men in South Korea, we find substantial additional employment capacity among older men (those aged 55 or more) as of 2016 comparable in size to those found in other advanced countries. We also find evidence that older men are not merely capable of working but are also willing to work, and many of them are increasingly combining pension income and work. These findings suggest that labor supply disincentives for older men embedded in public pension systems in South Korea need to be thoroughly reexamined and adjusted accordingly lest they should inhibit the labor supply of older workers.

Key Word: Employment, Mortality, Work Capacity, Retirement, Public Pension
JEL Code: J14, J21, J26

I. Introduction

Policymakers often presume that there would be substantial untapped health capacity to work among older people based on the simple observation that longevity has noticeably improved in South Korea, particularly over the past few

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decades. Moreover, this presumption can lead to policy proposals which may force older people to work longer over their life cycle. For example, the reform of the National Pension in 2009 raised the pensionable age from 60 in 2009 to 65 in 2033 and, more recently, the committee for the fourth actuarial projection of the National Pension suggested a further increase of the pensionable age to 68 by 2048.[1] These measures imply extended work years of individuals before they are allowed to receive the full benefits. Furthermore, the government organized a task force to set a higher age cutoff regarding the definition of an older person, which is currently 65, and this change, if implemented, will have much broader implications for social policies, including those related to the Basic Pension and Long-Term Care Insurance.

All of these policy measures attest to the fact that the health capacity to work among older workers represents essential information related to the design of public policies in an aging society, but there exists little empirical research based on which the underlying policy presumptions can be assessed. Country studies have already been conducted for twelve advanced countries through the International Social Security (ISS) project, which employed common methodologies to enhance cross-country comparisons of the results (Milligan and Wise, 2015; Wise, 2017). Providing an overview on the twelve country studies included in the ISS project, Coile, Milligan and Wise (2017) noted several common themes. First, older males in most countries as of 2010 have substantial additional work capacity when compared to men in 1977 with similar health status as measured by the mortality rate. Second, the estimated additional work capacity is reduced when compared to that of older men in 1995 because older men's employment rates reached a historical low in many countries during the mid-1990s owing to social security clauses that discouraged work. These findings from advanced countries, however, may not be directly extended to South Korea. Unlike most advanced countries where employment rates for older males declined substantially due to liberal benefit provisions of their public pension systems, the employment rate of older men in South Korea has remained at a high level at least over the last thirty years, possibly due to the absence or the low level of pension benefits.[2] The persistence of the high employment rate among older men in South Korea suggests that older men may not have much additional work capacity despite the improvement in their health status.

Thus, this paper aims to quantify older men's health capacity to work in South Korea for a comparison to those in other advanced countries and to examine the implications of the findings on social policy for the elderly. Using the method proposed by Milligan and Wise (2012) and also employed in several other country studies included in Wise (2017), we estimate substantial additional employment capacity among older men in South Korea in 2016 compared to those at similar health statuses a generation ago. The estimated total additional work capacity among men aged 55 to 69 is about 2.8 work-years, which is comparable in size to those found in other advanced countries. Notably, we find that the estimated total

[1]By 2030, the pensionable ages of the earnings-related pension plans will be 67 in many advanced countries, including the US, UK, Germany, Italy, Spain, and France, whereas Japan and South Korea will be notable exceptions with a pensionable age of 65 by that time (Lee, 2017).

[2]The National Pension System was enacted in 1971 but implemented in 1988. Given that many workers in the past remained uncovered by the National Pension during their work years while the full old-age benefits are provided for forty years of contributions, benefits from the public pension were minimal until very recently.

additional work capacity of men in their 70s is also quite large in South Korea. Furthermore, we provide evidence that many older men are not just capable of working but are also willing to work at later ages; nearly 76 percent of older men aged 55 to 79 in 2018 report that they are willing to work longer, and the desired age of labor market exit is well beyond the age of 70. In particular, we find that the share of pensioners who continue to work has increased over the last decade, supporting the aforementioned findings. In sum, many older men in South Korea are not only capable of working longer but are also willing to work longer, as noted above. These findings suggest that in response to improvements in life expectancy and health status which have continued for decades, policymakers must thoroughly reexamine and adjust the current institutional labor market environment so that capable and willing older people can work longer and are not discouraged by disincentives that may be embedded in current social policies, especially in the public pension policy and in legal institutions.

This article is organized as follows. In the next section, we first document the trend in the labor force participation of older workers in South Korea and compare it to the trends observed in other advanced countries. In section 3, we estimate the health capacity to work among the elderly in South Korea using micro data and compare the results with those found in other advanced countries. In section 4, we examine whether older people are willing to work more and the extent to which they combine work and pension income. In the last section, we conclude with policy implications as they may pertain to social security.

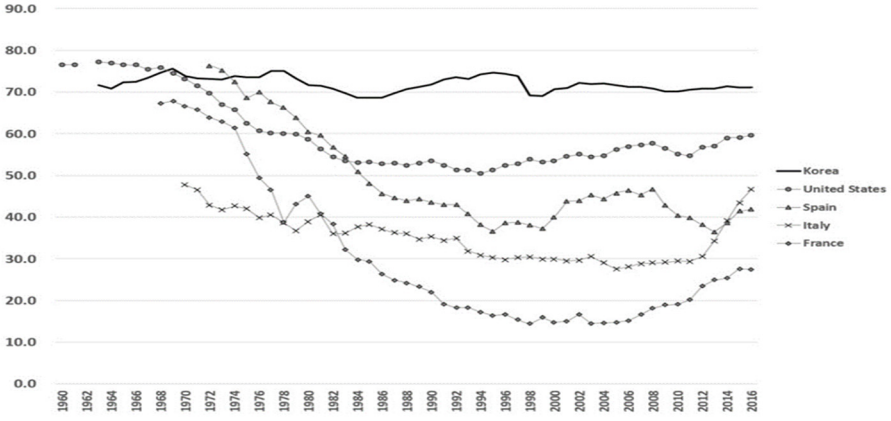
II. Trends in the Employment Rates of Older Men

A. *The Secular Decline in the Employment Rate of Older Men*

One of the most prominent features of the labor markets of advanced countries in the late twentieth century is the dramatic decline in the employment rates of the older men (Gruber and Wise, 1999). Figure 1 shows that the employment rate of men aged 60-64 in the United States dropped by 26.5 percentage points between 1960 and 1994, that in France fell by 53 percentage points between 1968 and 1998, and that in Germany declined by 44 percentage points between 1970 and 1994. Aside from Japan, other advanced countries underwent similar declines in the employment rates of older men over the same period (see panel B).

One explanation for the decline may be higher income. Because retirement is a normal good, the age of retirement may well decrease with higher incomes (Barr and Diamond, 2006). Indeed, this secular decline in labor force participation by older men has been documented in several countries, such as the United States, Great Britain, France, and Germany, with the beginning of the decline dating back to late nineteenth century (Costa, 1998). However, the depth of the decline in the employment rates during the 1970s and 1980s and the subsequent rebound after the 1990s can be better explained by the incentives embedded in social security systems. The postwar changes in pension provisions such as a reduction in the early retirement age without corresponding actuarial adjustment in pension benefits and an increase in the replacement rate of pension benefits led to the decline of the employment rates

[Panel A]



[Panel B]

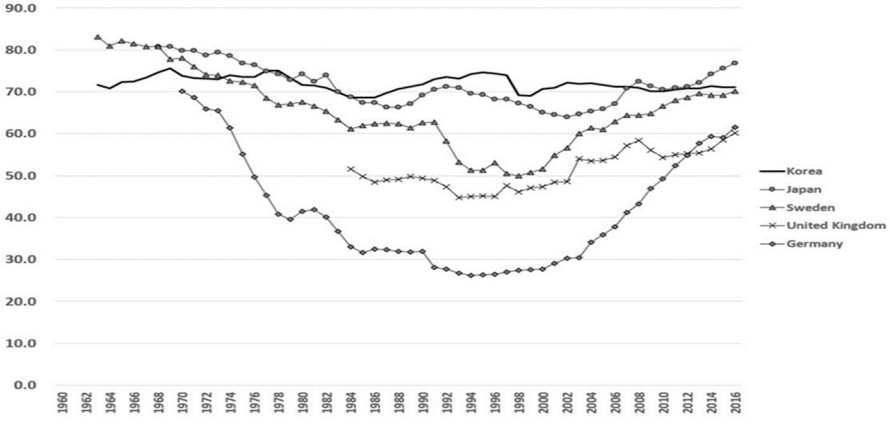


FIGURE 1. TRENDS OF THE LABOR FORCE PARTICIPATION RATES OF MEN AGED 60 TO 64, 1960-2014

Source: OECD (https://stats.oecd.org/Index.aspx?QueryId=67615; Last accessed: 9 Feb 2019).

in the advanced countries during the 1970s and 1980s (Gruber and Wise, 1999; 2004). The subsequent pension reform mitigating work disincentives embedded in pension provisions generated a rebound in the employment rates of older men in these countries during the mid-1990s.

It is notable that the employment rate of older men in South Korea shown in figure 1 did not exhibit a U-shaped pattern, unlike those in most advanced countries. This exceptionality is actually consistent with the explanation given above because the National Pension in South Korea was belatedly and partially implemented in 1988 while some of the features imposing work disincentive were redressed in the 1998 reform, and therefore, the labor supply of the older men who are eligible for the early retirement benefits was barely affected by pension provisions.[3]

[3]Lee (2005) calculated the simulated social security wealth accrual of the National Pension, showing that, prior to the normal retirement age of 60, the provisions of the National Pension do not impose implicit taxes on the additional year of work of the elderly (those who are born in 1947, began contributing in 1988, and would become eligible for the full benefits in 2007), and therefore, do not induce these workers to retire early.

B. *Unused Productive Capacity*

The withdrawal of older men from the labor force represents foregone productive capacity of the economy. To capture the extent of the labor force withdrawal of older men, Gruber and Wise (1999) utilized the measure of the *unused productive capacity* of older men, which is defined as the upper area of the age profile of the labor force participation rate. This measure does not have a natural unit and is hence useful only for cross-country comparisons, which was the primary objective of the project in Gruber and Wise (1999). During the 1990s, the unused productive capacity of older men in major European countries, including France, Italy, Germany, Spain, and the United Kingdom, ranged from 50 to 60 percent, whereas it was lower in the United States (37 percent), Sweden (35 percent), and Japan (22 percent).

Albeit simple and intuitive, the unused productive capacity does not account for cross-country differences in the health status of older men and labor market institutions. In the next section, we explain the concept of the *health capacity to work*, an alternative measure of the additional work capacity of older men. This measure differs from the unused productive capacity in that additional work capacity is measured after adjusting for the health status of a given age cohort. Another difference is that the upper bound of work capacity for a given health status is set by the employment rate of men in the same country a generation ago. Therefore, health capacity to work can be seen as a measure of additional work capacity for which health statuses and country-specific time-invariant factors are adjusted.

III. Estimating the Health Capacity to Work at Older Ages

A. *Milligan-Wise Method*

Following the eleven country studies in Wise (2017), we employ the same method developed in Milligan and Wise (2012) to estimate the health capacity to work of those aged 55 to 69. The Milligan-Wise Method answers the following question: Compared to men of the same level of health status thirty years ago, how much more can the current older men work? Using mortality as the primary measure of health status, they evaluate the current relationship between employment and mortality in light of the same relationship thirty years ago.

Evaluating the additional work capacity of a certain age cohort at a given year (the target year hereafter) in comparison to that in the past necessarily involves setting a reference year (thirty years before the target year, for example). Suppose that we set the target year 2016, which is the most recent year when the data are available, and the reference year 1986, which is the earliest year when the data are available. The additional work capacity of men aged 55 in 2016 can then be calculated based on the difference between the employment rates of men aged 55 in 2016 and of men in 1986 with the same mortality rate. This can be formally written as follows:

(1) $$c_{t=2016,\, a=55} = e_{t=1986,\, a=\bar{a}} - e_{t=2016,\, a=55},$$

where t denotes the year, a the age, c the additional work capacity, e the employment rate, m the mortality rate, and $\bar{a}$ the age in 1986 such that $m_{t=1986,\, a=\bar{a}} = m_{t=2016,\, a=55}$. The first term on the right-hand side of equation (1) can be interpreted as a point on the "labor supply possibility frontier," which health status permits, and thus the additional work capacity can be seen as a measure for evaluating the current relationship between the employment rate and mortality rate based on that labor supply possibility frontier. Here, $e_{t=1986,\, a=\bar{a}}$ can be estimated by linear interpolation.[4] The total additional work capacity of men aged 55 to 69 can then be obtained by summing the estimated additional work capacity of men over the ages from 55 to 69. The total additional work capacity of men aged 55 to 69 can be formally written as follows:

$$\sum_{g=55}^{69} c_{t=2016,\, a=g} \; .$$

It has to be noted that the employment rate in equation (1) is essentially conditioned solely on the mortality rate. This approach does not account for the fact that there can be many factors other than health affecting employment, such as educational attainment, pension wealth, industrial composition, and institutional environment. Therefore, the additional work capacity estimated by the Milligan-Wise Method should be interpreted as the *health capacity to work* of the elderly today in the sense that their health may not constrain them from working more, as it did not a generation ago for those having the same health status. If one is more concerned about work capacity conditional on other factors as well, a different approach is warranted, although results obtained after adjusting for demographic characteristics are broadly consistent with those obtained from the Milligan-Wise Method in most advanced countries (see Wise, 2017).[5]

We acknowledge that mortality is a limited measure of health, as it may not reflect chronic diseases, disabilities, and other activity limitations, all of which may be important determinants of work capacity.[6] Nevertheless, we focus on mortality for two reasons. First, a cross-country comparison of the estimated additional work capacity is one of the main objectives of this study, and this can be best achieved by using mortality, which is a reliable and common measure of health status across countries. Comparison based on self-assessed measures, another commonly used measure of health status, may not be directly comparable across countries due to differences in the wordings and scales used in the different surveys (Carlson, 1998;

[4]The estimated additional work capacity is not sensitive to the functional form of the interpolation.

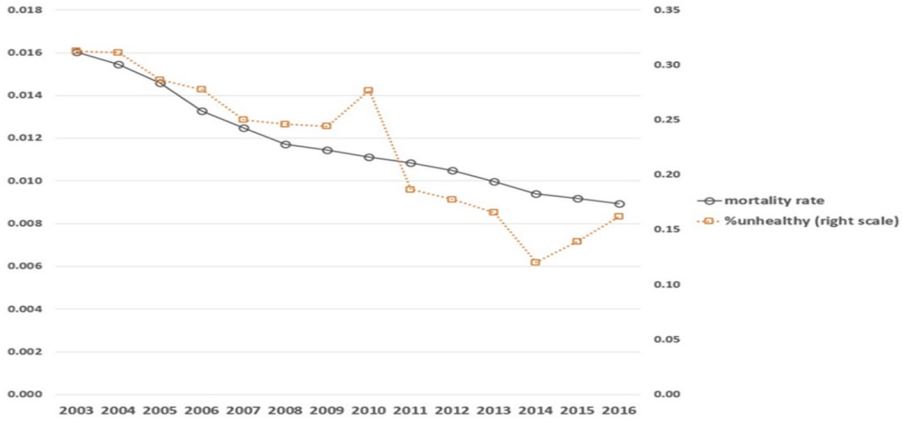
[5]An alternative approach can partly address this limitation of the Milligan-Wise Method. A simulation-based method developed by Cutler *et al.* (2011) measures work capacity by comparing the observed labor force participation rates of men aged 65 to 69 to simulated labor force participation rates for these cohorts ("capacity for work") based on estimated coefficients obtained for men aged 62 to 64. In the work-decision equation, this method adjusts for individual characteristics, including education, marital status, pension coverage, and self-reported health status. While this approach has the advantage of adjusting for some non-health characteristics that can affect the employment rate, substantial differences in the survey design and questionnaires across countries make it difficult to compare the results across countries.

[6]In early efforts to assess the work capacity of older people in the United States, Munnell and Sass (2008) examine long-term trends in disabilities, self-assessed health, as well as life expectancy of older people.

Jürges, 2007). Second, using mortality allows us to cover an extensive time span for the analysis. Previous studies compared the relationship between employment and mortality in 2010 to that in 1977 or 1995 (Wise, 2017). Mortality series go back to 1970 in South Korea, whereas the series of self-assessed health (SAH) measures in surveys are available only after 2003.

To verify that these alternative measures move together, we plot the SAH and the mortality rate together for the period when data are available. Since 2003, the Korean Labor and Income Panel Study (KLIPS) has collected information on self-assessed health status. The respondents are asked about their overall health status, reporting whether they are either very healthy, healthy, in fair health, in poor health, or in very poor health. Based on the responses, we calculate the SAH, the share of older respondents who reported their health status as poor or very poor. Figure 2 shows the SAH and mortality rate since 2003 for men aged 60 to 64 and those aged 65 or

[Panel A] Men aged 60 to 64



[Panel B] Men aged 65 or more

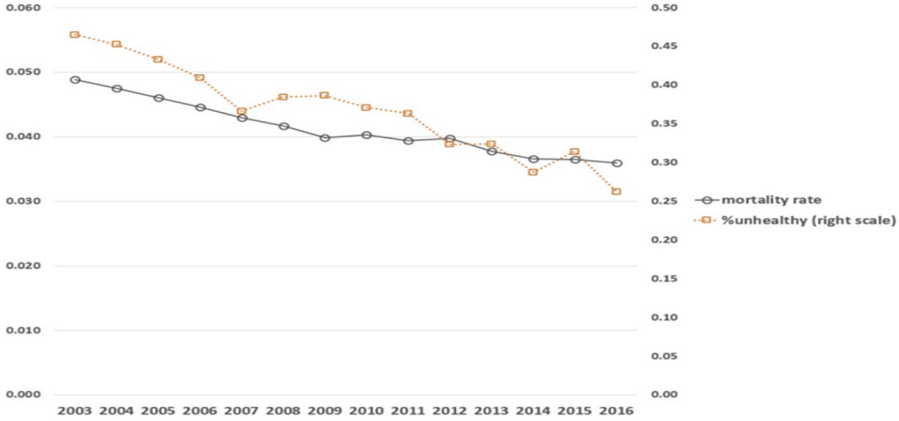


FIGURE 2. SELF-ASSESSED HEALTH (SAH) AND MORTALITY RATES FOR OLDER MEN

Note: All numbers are calculated based on sample weights.

Source: Author's calculations from the 2003-2016 waves of the Korean Labor and Income Panel Study.

more. We find that for both age groups, the SAH clearly declined with the mortality rate. Panel A in figure 2 shows that the share of men aged 60 to 64 who reported poor or very poor health has nearly been cut in half for the last fifteen years, along with the mortality rate. Similarly, the share of men aged 65 or more who reported poor or very poor health in panel B in figure 2 decreased by a third with the mortality rate.

B. *Data*

Mortality data for South Korea cannot be found in the Human Mortality Database, the common source of long-term mortality and birth data for many countries, mainly because infant mortality data in South Korea are considered to be unreliable before 1970. Instead, we calculate sex- and age-specific mortality rates, which were converted from the sex- and age-specific death rates that can be found in the Life Table, published by Statistics Korea since 1970.[7] We use employment data from the Korean Labor Force Survey (LFS) which are available from 1986 to 2016. The target year is 2016 and our preferred baseline year is 1986, a generation before the target year.

Following the literature, we restrict our analysis to men only, as the secular rise in women's labor participation makes it difficult to interpret the results for women. Although we can predict that the underlying relationship between work and health should be similar between men and women, changes in factors affecting decisions to work over life cycles across different cohorts of women (Schirle, 2008; Goldin and Katz, 2018) complicate analysis of the historical work-health relationship.

C. *Additional Work Capacity among Men Aged 55 to 69*

One can easily grasp the underlying idea of the Milligan-Wise Method by inspecting figure 3, which plots the relationships between employment rates and mortality rates in 1986 and 2016. Consider first the 2016 employment-mortality curve. In 2016, the mortality rate for 55-year-old men was 0.005 and the employment rate was 89.1%. Men's employment rate decreases as the mortality rate increases. In 2016, the mortality rate for 69-year-old men was 0.016 and the employment rate was 49.7%. In figure 3, the 1986 employment-mortality curve clearly lies above the 2016 curve. For a given health status, the employment rates of men in 1986 were higher than those in 2016. The gap in the employment rate for a given mortality rate is substantial. In 2016, the employment rate of men having a mortality rate of 0.011 (at age 65) was 62%. In 1986, the employment rate of men having the same mortality rate (at age 50) was 88.5%. This suggests that in 2016, the employment rates of men at age 65 could be higher by 26.4 percentage points if these men had worked at their maximum health capacity.

Similar calculations can be done for each mortality rate, and these results are presented in table 1. For example, 3.85 percent of men aged 55 in 2016 could have worked more, which implies 0.385 additional work-years. By aggregating the estimated additional employment capacity over the ages from 55 to 69, we obtain

[7] $q_x = \frac{m_x}{1+m_x}$, where q_x denotes the death rate at age x and m_x is the mortality rate at age x, which is defined as the ratio of the number of deaths at age x over the size of the population at age x (Statistics Korea, 2016).

2.82 work-years of the *total additional employment capacity* of men aged from 55 to 69 in 2016 in reference to 1986, which can be found at the bottom of column (5) in table 1. This is a 26.6 percent increase from the 10.6 work-years for men aged 55 to 69 in 2016.

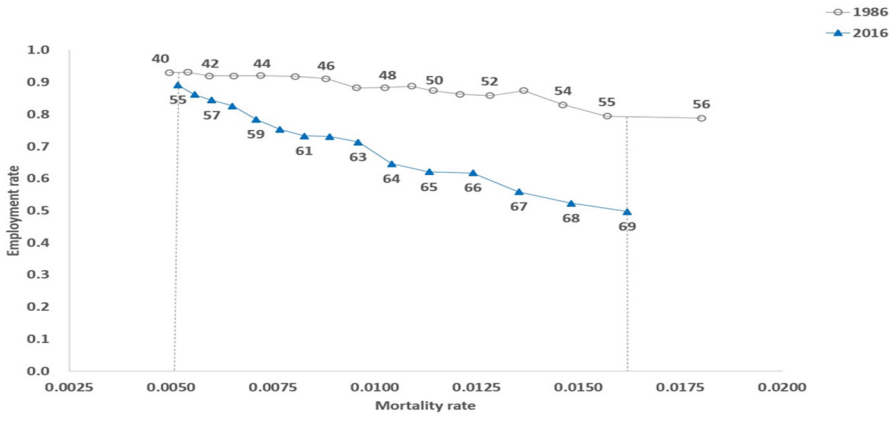


FIGURE 3. MEN'S EMPLOYMENT RATES AND MORTALITY RATES IN 1986 AND 2016 FOR THOSE AGED 55-69

Note: The curve below is plotted for male cohorts aged 55 to 69 in 2016. The curve above is plotted for male cohorts in 1986 having the same mortality rate.

Source: Author's calculations.

TABLE 1—ADDITIONAL EMPLOYMENT CAPACITY OF MEN AGED 55-69 IN 2016 COMPARED TO 1986

Age of men	Mortality rate in 2016 (%)	Employment rate in 2016 (%)	Employment rate in 1986 at same mortality rate (%)	Additional employment capacity (%)	Number of employees in 2016	Potential number of additional employees
(1)	(2)	(3)	(4)	(5)	(6)	(7)
55	0.52	89.14	92.99	3.85	381,121	16,457
56	0.56	86.21	93.08	6.88	375,937	29,990
57	0.60	84.44	92.80	8.36	349,923	34,654
58	0.65	82.60	91.98	9.37	326,440	37,035
59	0.71	78.48	91.97	13.49	285,940	49,156
60	0.77	75.36	92.06	16.70	225,899	50,064
61	0.83	73.33	91.92	18.59	253,990	64,372
62	0.89	73.08	91.40	18.33	197,455	49,516
63	0.96	71.41	89.33	17.92	196,732	49,362
64	1.04	64.62	88.33	23.71	172,778	63,405
65	1.13	62.07	88.48	26.41	121,232	51,576
66	1.24	61.79	86.37	24.58	131,607	52,351
67	1.35	55.89	86.25	30.36	112,818	61,276
68	1.48	52.34	84.90	32.57	109,450	68,103
69	1.62	49.69	80.35	30.66	105,130	64,858
Total additional employment capacity		10.60		2.82	3,346,450	742,177

Note: The figures in column (4), which correspond to the mortality rates in column (2), are obtained by means of linear interpolation. The unit of total additional employment capacity is work years or number of persons.

Source: Author's calculations.

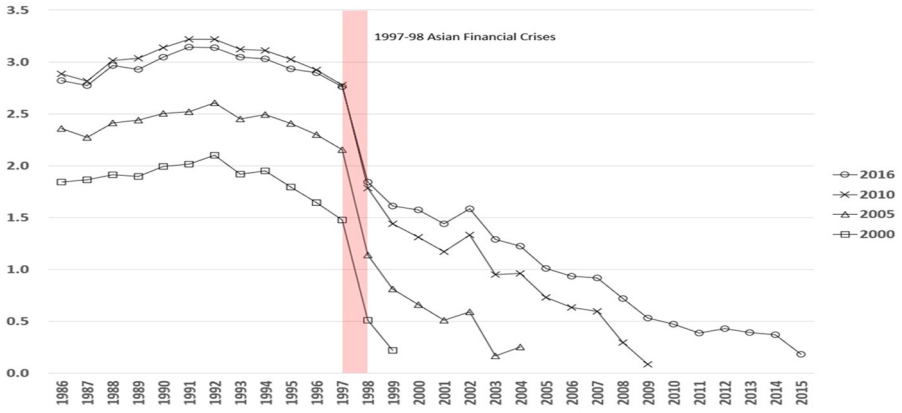


FIGURE 4. ESTIMATED TOTAL ADDITIONAL WORK CAPACITY ACROSS DIFFERENT REFERENCE YEARS

Note: The horizontal axis represents the reference year, and the vertical axis denotes the estimated total additional work capacity among men aged 55 to 69. Four different curves are obtained for different target years of 2000, 2005, 2010, and 2016. The box shows the 1997-97 Asian Financial Crisis.

Source: Author's calculations.

This exercise is based on the implicit assumption that the cohort size is equal across all age groups. We can use the size of the population as the weight to calculate the potential number of additional employees, as presented in column (7) of table 1. The potential number of additional employees for men aged 55 to 69 is 742,177, a 22.2 percent increase from the current pool of 3,346,450 employees aged 55 to 69 in 2016. The rate of increase in the number of employees is smaller than that in work-years because older men having a greater work capacity comprise less of the population aged 55 to 69. The potential number of additional employees is easier to interpret than the total additional work-years, but we will use the latter as our primary measure to maintain cross-country comparability of the results.

The additional employment capacity can critically depend on the choice of reference year because the employment-mortality curve in the reference year acts as an employment possibility frontier as a function of health. Figure 4 clearly shows that the total additional employment capacity in 2016 does depend on each reference year for 1986-2015. It should also be noted that the total additional employment capacity becomes quite small when compared to those in recent years. However, the employment-mortality curve did not change much before the major supply shock in 1998, when the Asian Financial Crisis generated massive layoffs of older men in South Korea.[8] Lastly, figure 4 also indicates that for a given reference year, additional employment capacity increases over time, although the increasing trend appears to wane starting in 2010.

[8]Over the years 1997-98, about 0.63 million male workers lost their jobs. Most of them were in their late 20s and early 30s, i.e., early in their careers, but many men aged 54 and 55 were also laid off before their normal retirement age.

D. *Additional Work Capacity among Men Aged 70 to 84*

In South Korea, the effective age of labor market exit of men in 2016 was seventy two, which is highest among OECD countries (OECD, 2017).[9] Therefore, we also examine additional employment capacity for men aged 70 to 84. Figure 5 depicts the employment -mortality curves in 1986 and 2016 for men aged 70 to 84. The employment rate of men aged 70 in 2016 is quite high, but we still find a nontrivial size of work capacity, and men's additional employment capacity mostly disappears only at the age of 79.

The additional employment capacity measured in terms of work-years of men aged 70 to 84 can be found at the bottom of column (5) in table 2, and it is surprisingly similar in size to that of men aged 55 to 69. In terms of the potential number of additional employees, the size is much smaller as the population of men aged 70 to 84 is much smaller than that of men aged 55 to 69.

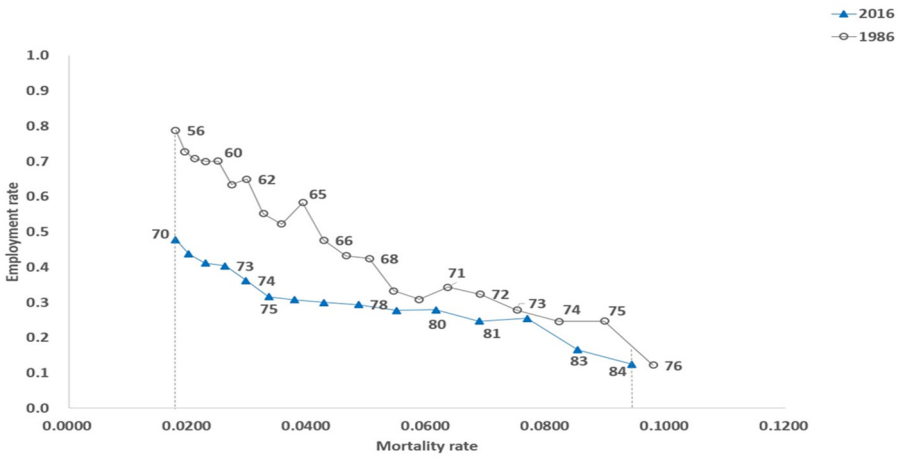


FIGURE 5. MEN'S EMPLOYMENT RATES AND MORTALITY RATES IN 1986 AND 2016 FOR THOSE AGED 70-84

Note: The curve below is plotted for male cohorts aged 55 to 69 in 2016. The curve above is plotted for male cohorts in 1986 having the same mortality rate.

Source: Author's calculations.

[9]This may not be surprising because most older men and women in South Korea do not have pension wealth, partly because the pension system was implemented relatively recently, and income support from their children has increasingly weakened. On the other hand, it also reflects that the older people are quite healthy in South Korea.

TABLE 2—ADDITIONAL EMPLOYMENT CAPACITY OF MEN AGED 70-84 IN 2016 COMPARED TO 1986

Age of men	Mortality rate in 2016 (%)	Employment rate in 2016 (%)	Employment rate in 1986 at same mortality rate (%)	Additional employment capacity (%)	Number of employees in 2016	Potential number of additional employees
(1)	(2)	(3)	(4)	(5)	(6)	(7)
70	1.78	47.82	78.86	31.05	77,103	50,060
71	2.01	43.74	71.96	28.22	62,926	40,609
72	2.29	41.15	70.03	28.88	60,370	42,361
73	2.61	40.38	66.82	26.44	63,935	41,868
74	2.97	36.20	64.90	28.70	58,032	46,006
75	3.35	31.65	54.28	22.63	45,933	32,834
76	3.78	30.77	56.03	25.26	43,880	36,020
77	4.27	30.02	47.60	17.58	35,680	20,898
78	4.85	29.41	42.82	13.41	29,200	13,320
79	5.48	27.75	33.06	5.32	26,305	5,041
80	6.15	27.89	32.89	5.01	20,935	3,758
81	6.87	24.71	32.43	7.72	20,544	6,419
82	7.67	25.49	27.06	1.57	16,898	1,040
83	8.52	16.56	24.68	8.13	8,391	4,119
84	9.42	12.55	17.79	5.24	5,280	2,206
Total additional employment capacity		4.66		2.55	575,412	346,559

Note: The figures in column (4), which correspond to the mortality rates in column (2), are obtained by means of linear interpolation. The unit of total additional employment capacity is work years or number of persons.

Source: Author's calculations.

E. *Cross-country Comparison*

Table 3 presents a cross-country comparison of the additional employment capacity of men aged 55 to 69 in 2010 as measured in terms of the total additional

TABLE 3—ADDITIONAL EMPLOYMENT CAPACITY OF MEN IN 2010: CROSS-COUNTRY COMPARISON

Country	2010 vs. 1977	2010 vs. 1995
	(1)	(2)
Belgium	5.0	1.0
Canada	4.9	1.3
Denmark	4.7	1.6
France	8.0	2.2
Germany	5.9	2.6
Italy	7.7	2.7
Japan	3.7	2.2
Netherlands	3.4	-0.1
Spain	7.0	2.2
Sweden	3.2	0.8
United Kingdom	8.4	1.8
United States	4.2	1.8
South Korea	2.9	3.0

Note: In some cases, the years used differ, as follows: Belgium (1983 not 1977); Germany (2005-09 not 2010, 1989-1995 not 1995, 1976-1980 not 1977); Japan (1975 not 1977); Netherlands (1981 not 1977); South Korea (1986 not 1977), and Sweden (2009 not 2010, 1985 not 1977).

Source: Author's calculations for South Korea, and Wise (2017: 13) for the other countries.

work-years. The reference years are 1977 and 1995, but they can vary by country depending on data availability. Column (1) of table 3 shows the total additional employment capacity of men aged 55 to 69 in 2010 when the reference year is 1977. The 2.9 work-years of total additional employment capacity in South Korea is less than those in other countries, whose average amounts to 5.5 work-years. This may have arisen because the reference year was actually 1986, rather than 1977, for South Korea due to data availability. When the reference year is changed to 1995, as in column (2) in table 3, the total additional employment capacity becomes smaller for most countries. South Korea is the exception here because the employment rate in the reference year remained high, although it clearly declined after 1998, as shown in figure 4.

IV. Willingness to Work among Older People and Pensioners

Health capacity to work is one consideration and willingness to work is another. Even when improved health enables older people to work longer in their life cycle, they may not be willing to work if they value post-retirement leisure more than extended work. Therefore, information on willingness to work among older people is no less relevant for policymakers than information on the health capacity to work. In particular, willingness to work among pensioners has important implications for public pension policies given that one of the overarching themes of pension policy in an ageing society is to combine "work and pension" (OECD, 2017).

To shed light on the willingness to work among the elderly, including pensioners, we examine survey evidence pertaining to willingness to work among the elderly in South Korea. First, using a nationally representative survey, we document the share of older people reporting that they are willing to work longer regardless of their age. We acknowledge that the labor supply decisions of the elderly will ultimately depend on the nature of the work and on the wage rates in the market, but we proceed by making the implicit assumption that the older people who responded to the survey questions were aware of the prevailing market conditions. Second, we examine the trend in the labor force participation rate of pensioners, which will reflect willingness to work among the more affluent elderly.

A. *Willingness to Work among Older Men*

To examine willingness to work among older men in South Korea, we use the most recent wave of the Elderly Supplement to the LFS from Statistics Korea. In the 2018 supplement, respondents aged 55 to 79 are asked whether they are willing to do paid work regardless of their age. If they answer in the affirmative, they are further asked about the main reason for wanting paid work and their desired age of labor market exit.

Table 4 shows the share of older men who want to work longer for earnings as well as the distribution of the desired age of labor market exit for men by age group. Panel A in table 4 shows that seventy six percent (about 4.8 million) of male respondents aged 55 to 79 wanted to work longer for earnings. Although willingness to work declines for older age groups, it is notable that men over age 70 still wanted

TABLE 4—ADDITIONAL EMPLOYMENT CAPACITY OF MEN IN 2010: CROSS-COUNTRY COMPARISON

Age group	55-59	60-64	65-69	70-74	75-79	Total
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A. *Number of men who are willing to work longer*						
Male population	2,148,176	1,651,883	1,128,372	810,864	655,903	6,395,197
Willing to work longer	1,931,766	1,397,849	812,811	458,457	235,208	4,836,092
Share	0.90	0.85	0.72	0.57	0.36	0.76
Panel B. *Distribution of desired age upon labor market exit*						
Exit at 55 to 59	0.00	n/a	n/a	n/a	n/a	0.00
60 to 64	0.04	0.00	n/a	n/a	n/a	0.02
65 to 69	0.23	0.09	0.01	n/a	n/a	0.12
70 to 74	0.49	0.58	0.32	0.02	n/a	0.42
75 or more	0.25	0.33	0.68	0.98	1.00	0.45

Note: "n/a" means not applicable.

Source: Author's calculations from the 2018 wave of the Elderly Supplement of the Korean Labor Force Survey.

to work longer: fifty seven percent of men aged 70 to 74, and thirty six percent of men aged 75 to 79. For most of the elderly (59%), the main reason for wanting paid work was to earn money to pay living expenses, but about thirty four percent reported that they wanted to work as long as their health allows, as working is a pleasure for them. Panel B in table 4 shows that the mean desired age at retirement was seventy three, but many in their late 70s wanted to retire at age 81. Most men aged 55 to 59 who are close to the statutory retirement age wanted to retire at age 70.

B. *Labor Force Participation among Pensioners*

To investigate trends with regard to the extent of pensioners who are engaging in paid work, we use six waves (2006-2016) of the Korean Longitudinal Study of Aging (KLoSA), which contains information both on employment status and benefit receipt from the public pension (the National Pension, and occupational pensions).[10] KLoSA is a nationally representative biennial public-use survey from the Korea Employment Information Service. The survey began in 2006 with 10,254 people aged 45 or more who resided in South Korea other than Jeju Island. In 2014, 920 people born around 1962-63 were added, and the size of the consolidated sample in 2016 was 7,460. All numbers presented in tables are produced based on sample weights.

We define pensioners as those receiving benefits either from the National Pension or from occupational pensions such as the Government Employees Pension, the Teachers' Pension, or the Military Pension. Table 5 shows the changes over the years

[10]The Elderly Supplement of the LFS also contains information about public pension receipt, but the coded responses do not distinguish between contributory public pensions and noncontributory pensions. The distinction can be important for policy purposes because the labor disincentives discussed in the next section only apply to contributory public pensions such as the National Pension and to occupational pensions.

TABLE 5—COMBINING PENSION INCOME AND WORK IN SOUTH KOREA

Survey year		2006	2008	2010	2012	2014	2016
Panel A. *Pensioner share*							
National Pension	Aged 60 to 64	0.39	0.46	0.49	0.45	0.44	0.41
	65-69	0.30	0.43	0.51	0.60	0.60	0.62
	70-74	0.13	0.20	0.30	0.35	0.42	0.47
Occupational Pension	60-64	0.07	0.09	0.08	0.07	0.10	0.07
	65-69	0.08	0.10	0.11	0.15	0.12	0.11
	70-74	0.08	0.09	0.10	0.11	0.11	0.10
Panel B. *Worker share by pensioner status*							
National Pension	Aged 60 to 64	0.50	0.56	0.58	0.53	0.63	0.71
	65-69	0.37	0.38	0.40	0.44	0.39	0.47
	70-74	0.14	0.17	0.17	0.18	0.19	0.17
Occupational Pension	60-64	0.30	0.19	0.16	0.30	0.32	0.31
	65-69	0.10	0.14	0.23	0.20	0.09	0.12
	70-74	0.10	0.03	0.05	0.06	0.06	0.06
None	60-64	0.53	0.58	0.64	0.58	0.66	0.65
	65-69	0.30	0.32	0.43	0.47	0.42	0.46
	70-74	0.09	0.14	0.16	0.16	0.16	0.15

Source: Author's calculations from the 2006-2016 waves of the Korean Longitudinal Study of Aging.

2006 to 2016 in the share of pensioners by age group as well as the share of men participating in the labor force among the pensioners. In panel A of table 5, we find that the share of pensioners among men aged 60 or more is rising steadily, although the share among men aged 60 to 64 has declined since 2010, possibly due to the increase in the pensionable age. Panel B of table 5 shows that until 2014, those who were receiving benefits from the National Pension were slightly less active in the labor market than those who are not entitled to the National Pension, but this trend reversed in 2016 across all age groups. The majority of pensioners from the National Pension aged 60 to 64 are participating in the labor market throughout the sample periods, and the share increased to seventy one percent in 2016. Among men aged 65 to 69, the share of pensioners participating in the labor force increased to fourty seven percent in 2016, although the share among men aged 70 or more stagnated at around seventeen percent. In contrast, pensioners from occupational pensions do not appear to be as active, mainly because the replacement rates of occupational pensions are substantially higher than that of the National Pension.

In sum, substantial numbers of pensioners from the National Pension are participating in the labor market, and the share has been rising for the last ten years. Without raising the replacement rate of the National Pension substantially, which is unlikely given public sentiment against higher pension contributions, we can expect that the majority of pensioners will continue to participate in the labor force.

V. Policy Implications

When measured by mortality rate, the current older men are as healthy as those who were younger by ten years a generation ago, and this remarkable improvement in health status has led to substantial potential employment capacity. Moreover, a large share of capable older men (mostly in their 60s, but some in their 70s) is willing to do paid work regardless of their age or pensioner status. It has to be noted that our results imply neither that the elderly should work more given the additional work capacity nor that their participation in the labor force will be necessarily welfare-enhancing. Rather, our results imply with regard to policy that it would be undesirable to impose labor disincentives for the elderly when they are actually healthy enough and willing to work more.[11] Lest the government should discourage the labor supply of older people who are healthy and willing to work, it must thoroughly examine the tax and social insurance system while also making timely and proper adjustments in provisions.

For instance, public pensions in South Korea impose on pensioners aged 60 to 64 an apparent labor disincentive. The benefits of the National Pension can be reduced by 50% at a maximum if pensioners aged 60 to 64 earn more than the average earnings of the contributors (monthly earnings of about two million won). This implies that for these groups, the overall marginal tax rate ranges from 20 to 49 percent within a relatively modest income bracket (See table 6).[12] Moreover, the number of pensioners subject to a benefit reduction has been increasing rapidly in recent years as those in the baby-boom generation born after 1955 begin to retire, as shown in table 6. This benefit reduction due to work is not the rule in advanced economies, and many countries have recently abolished it, acknowledging its clear disincentives for work (OECD, 2017).

We have not considered the labor demand for older people, which remains the clearest limitation of this paper. Thus, we briefly discuss the labor-market environment, which may decrease the demand for older people. Labor contracts in South Korea typically consist of a seniority-based wage for loyalty combined with a performance wage, with the former implying that wages may well exceed marginal productivity at some point in one's career. In this case, mandatory retirement should be part of the labor contract or the legal system. Hence, to improve the labor market environment for older people, institutional adjustments such as the introduction of a peak-wage system should be considered along with an increase (or the abolishment) of the mandatory retirement age (Kim, 2011; Cho, 2012).

[11]Although we do not formally analyze the welfare implications of a potential increase in the labor supply among the elderly, tax wedges will impose substantial excess burden to the extent that older people's labor supply is elastic with respect to the wage rate. Another concern for welfare implications of higher labor participation among the elderly is that they may compete with and replace younger workers in the labor market. However, evidence suggests that they are not substitutes, and even more so in the long run, considering that women's labor force participation did not replace the male labor force (see Gruber and Wise 2010 for more discussion).

[12]There exists a ceiling for the amount of pension reduction, but it will not bind unless pensioners earn much more than their pre-retirement earnings.

TABLE 6—TAX WEDGES FOR THE LABOR SUPPLY OF PENSIONERS RECEIVING THE NATIONAL PENSION AGED 60 TO 64

Average monthly earnings	Implicit marginal tax rate of pension reduction	Marginal income tax rate	Overall marginal tax rate	Number of pensioners subject to pension reduction		
				2015	2016	2017
[100, 200)	0.00	0.06	0.06	n/a	n/a	n/a
[200, 300)	0.05	0.15	0.20	3,738	104,643	202,606
[300, 400)	0.10	0.15	0.25	1,543	5,714	9,047
[400, 500)	0.15	0.15	0.30	823	2,948	4,461
[500, 600)	0.20	0.24	0.44	424	1,425	2,189
[600, 700)	0.25	0.24	0.49			
[700, 800)	0.25	0.24	0.49	1,411	4,063	6,420
[800, 900)	0.25	0.24	0.49			
900 or more	0.25	0.35 or higher	0.60 or higher			
Total	n/a	n/a	n/a	7,939	118,793	224,723

Note: Monthly earnings are shown in current ten thousand won. The marginal tax rates are simulated. To calculate marginal income tax rate, we applied standard earnings exemptions and personal exemptions for two (worker and spouse). The tax rates are calculated based on the mean monthly earnings in each bracket. Here, "n/a" means not applicable.

Source: Author's calculations and the National Pension Service.

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