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Labour Supply Incentives of Social Security Programs: Some Australian Lessons for the Korean Case

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The retirement income system in South Korea is a patchwork of different programs, none of which is particularly effective at reducing poverty among senior citizens. Program benefits are very poorly targeted, meaning a very large fraction of the elderly receive modest benefits that are generally inadequate to lift a household out of poverty. The consequence is that South Korea has the highest elderly poverty rate in the OECD.[1] I will argue that a better targeted system – with more generous benefits aimed at fewer recipients – is likely to be welfare enhancing.

However, it seems clear that elderly poverty in Korea cannot be addressed merely by reforming the retirement income system. To address the root causes of the problem, structural reforms are needed to break down Korea's dual labor market system. Under that system, a large share of workers are in informal jobs where they do not make or receive mandated retirement contributions.

1. Korea's retirement income system

Good descriptions of Korea's retirement income system can be found in Jones and Urasawa (2014) and OECD (2016, 2017, 2018a, b). Under the current system, income support for the 65 and over population comes from four main sources:

The first is the Basic Old Age Pension (BOAP), which is a safety-net pension not tied to earnings. It provides a very small benefit (approximately 5.5% of the average wage in 2016) to a very broad population (approximately 67% of senior citizens).

Second, the National Pension Scheme (NPS) provides benefits that are tied to earnings. It relies on a progressive benefit formula, where an individual's benefit depends on

[1] According to the most recent OECD data the 'relative' poverty rate among people over 65 in Korea in 2019 was 43.8% (see https://data.oecd.org/inequality/poverty-rate.htm), where relative poverty is defined as income less than half the median.

both the average wage in the economy and the individual's average lifetime earnings. Kim (2020) describes the formula in detail. Both the coverage of the program and typical benefit levels for those who are covered are low. According to OECD (2018b), the NPS provided old-age pension benefits to only 33.8% of the elderly in 2017.[2] Moreover, average pension benefits are only 23.5% of the average wage.

Third, there is the company pension system launched in 2005. According to Jones and Urasawa (2014), the system is at an early stage of development, with only 24.7% of employees enrolled in 2012 and only 3% receiving payments, at a replacement rate of only about 12.5% (see Chung, 2010).[3]

Finally, an additional safety-net is the Basic Livelihood Security Programme (BLSP), a general social welfare program. But according to OECD (2018b) the BLSP "provided benefits to only 6.7% of the elderly in 2015, reflecting the exclusion of older persons with the possibility of assistance from family members." Note that eligibility depends only on the *possibility* of assistance, regardless of whether it is actually received.[4]

It is important to understand why such a small fraction of the elderly receive NPS benefits, and why the benefits they do receive tend to be so low. According to Jones and Urasawa (2014), the NPS is designed so that a worker at the economywide average wage for a full 40 years would obtain a 40% replacement rate. However, they note that "in 2012… the number actually contributing to the NPS was … 43% of the working-age population… *The low share reflects the large number of self-employed and non-regular workers, who can evade contributions*…. (emphasis added)." The importance of the informal labor market also helps to explain the low rate of participation in the company pension system.

Jones and Urasawa (2014) go on to state that "Even in the long term, the NPS will be insufficient to prevent poverty among the elderly given its low coverage, *the limited contribution history of pension recipients* and the low targeted replacement rate (emphasis added). The average contribution period of pension recipients over 2030-40 is projected to be

[2] According to government projections made in 2013, only 41% of the elderly are expected to receive NPS benefits in 2030 (OECD, 2016).

[3] In addition, a select group of workers can rely on the three occupational pension schemes for civil servants, military personnel and private-school teachers. According to OECD (2018a) these insure more than 1.5 million workers, with the scheme for civil servants accounting for more than two-thirds of the total. The occupational pensions have a rather generous replacement rate (76%) compared with the NPS.

[4] According to OECD (2016), the BLSP eligibility criteria were relaxed in 2015, but this only increased the share of elderly receiving benefits from 6.3% to 6.8%. These recipiency rates are very low given an estimated one quarter of the elderly are in absolute poverty (see OECD, 2018a). Furthermore, according to OECD (2018a) "… the benefit level of the BLSP programme is rather limited. …a single person eligible for the living and housing benefits would receive only about 24% of the median household income in Korea."

less than half of the full period of 40 years on which the 40% replacement rate is based. Only 41% of the elderly will receive an NPS pension in 2030." The reason that contribution histories tend to fall far short of the full 40 years is the combination of the dual labor market and early retirement age. The fundamental causes of the dual system are high firing costs, and a rigid seniority wage system (which drives early exit from the formal labor market).

2. Employment and poverty among older workers in Korea

A striking feature of the Korean economy is the high labor force participation rate of older workers. According to OECD (2017), the average labor market exit age is 72. According to Jones and Urasawa (2014), in 2012, 43% of 65-to-69 year olds were working, which is almost double the OECD average of 23%. Furthermore, 59% of the men working past the age of 65 are self-employed (see Lee and Lee, 2011). Jones and Urasawa (2014) note that "The biggest obstacle to [formal] employment of older persons is the relatively young age at which workers leave firms. The average mandatory retirement age set by firms is 57 and many workers depart even earlier, as the importance of seniority in determining salaries makes firms anxious to reduce the number of high-wage older workers."[5]

The high employment rate of the over 65 population does not translate into high income, because older workers are typically working at low wage jobs in the informal sector. As Jones and Urasawa (2014) note: "One-half of Korea's population aged 65 and over lives in relative poverty, nearly four times higher than the OECD average of 13%."[6] They also note that "In 2012, 26% of the elderly has a monthly income below 450 thousand KRW ($433), well below the minimum cost of living set by the government at 553 thousand KRW (MHW, 2013), which would place them in absolute poverty." They go on to note that the elderly in Korea have traditionally received a great deal of family support. However, as the elderly population has grown rapidly in recent years (due to population aging) the fraction of the elderly living alone has increased rapidly, and family support has declined.

The poor targeting of the BOAP, described earlier, means it does little to reduce the high poverty rate among the elderly. The BLSP does little either, both because benefits are small and because many elderly are not eligible. And NPS pension benefits are also

[5] Beginning in 2016 the mandatory retirement age was increased to 60 in large firms with more than 300 workers. However, according to OECD (2016), many workers retire before the mandatory age: "The mandatory retirement age set by firms is 58 on average, but workers leave at 53 on average as firms push out employees, particularly those with non-regular status. Many become self-employed…"

[6] According to OECD (2018), the elderly poverty rate was 45.7% in 2015 for the over-65 age group, 3.6-times higher than the OECD average of 12.6%. And the absolute poverty rate – the share with an income below the minimum cost of living – was around 30%.

inadequate to substantially reduce elderly poverty because, as noted earlier, both NPS coverage and typical years of contribution (and hence typical replacement rates) are low due to the large informal labor market and the prevalence of early retirement.

The problem of old age poverty in Korea is likely to grow more severe over time due to population ageing. The rate of population aging in Korea is projected to be the fastest in the OECD, as the fertility rate has recently fallen below 1.0 (see The Financial Times, August 28, 2019). According to Jones and Urasawa (2014) the number of persons of working age is projected to fall from 6.0 per elderly in 2010 to only 1.3 in 2050. This will increase the burden of the retirement income system on the working age population, and it is likely to also reduce family support for the elderly. Given projections of population aging, any attempt to reduce poverty among the elderly simply by increasing the generosity of the BOAP is likely to create severe budgetary pressures.

3. Benefits of improved pension targeting

The Basic Old Age Pension (BOPA) is essentially a means-tested transfer program, because the maximum benefit is not tied to earnings history. According to OECD (2018b), the BOPA "spreads resources very thinly over a large segment of the older population." As they note, the BOAP "amounted to 5.5% of the average wage in 2016, the lowest in the OECD. And it is given to 67% of the elderly – a very high coverage compared to an average of 22% for safety-net pensions in the OECD."[7] Thus, viewed as a transfer program, *the BOAP is very poorly targeted.* According to OECD (2016) the BOAP benefit was KRW 200,000 in 2014, which was only 6.2% of the average wage. It was inadequate to cover the minimum cost of living, or absolute poverty line, which was KRW 617,000 in 2015.[8]

The BOAP could be better targeted by increasing the minimum benefit substantially while simultaneously applying very strict means testing so that benefits are reduced nearly one-for-one with respect to income from earnings, pensions, assets and other sources. The rate at which means-tested benefits are reduced as a recipient's income increases is known as

[7] According to OECD (2016), the BOAP was doubled to 6.2% of the average wage in 2014, and it is given to around 70% of the elderly – a very high coverage compared to 24% for safety-net pensions in the OECD (Panel B). It thus spreads resources very thinly over a large segment of the older population.

[8] According to OECD (2017), the maximum BOAP benefit is equal to KRW204010 which is about 10% of the three-year average earnings of the insured under the NPS. Seniors receiving no benefit from NPS, or less than KRW306015 per month from their NPS pension, get KRW204010 per month. The remaining seniors receive a BOAP benefit according to the formula: (KRW204010 - 2/3(NPS) + KRW102005). The couple rate is 80% of single rate each. This formula creates a weak connection between the BOAP benefit and earnings history for the small fraction of workers with large NPS benefits. [Note: This reform was introduced in 2014, at which point the BOAP was renamed simply the Basic Pension Scheme (BPS). I will to the means-tested pension program as BOAP throughout to avoid potential confusion from changing the acronym in 2014.]

the "taper rate." If the BOAP were redesigned to have: (i) a minimum benefit near the poverty line, combined with (ii) a high taper rate, then program could substantially reduce poverty while substantially reducing the fraction of non-poor senior citizens (i.e., the approximately 2/3 who are ***not*** in absolute poverty).

The poor targeting of the BOAP is particular undesirable because Korea has a high degree of intra-generational inequality *among* senior citizens. According to Byun (2017), the "high elderly poverty rate reflects intra-generational inequality as much as inter-generational inequality in the country. Indeed, a substantial share of Korean elderly can rely on generous pension benefits if they retired from public sector jobs, or rental incomes from their owned dwellings (Statistics Korea, 2017)." He went on to note that when the basic old-age pension was introduced in 2014, it was hotly debated "whether the government should provide basic pensions to all elderly or only to the poor elderly … It ended up giving a small amount (180 USD/month) to 70 percent of the elderly population, using general tax revenues." The high degree of inequality among the elderly implies that many would receive little or no government pension under a well-targeted means tested pension system.

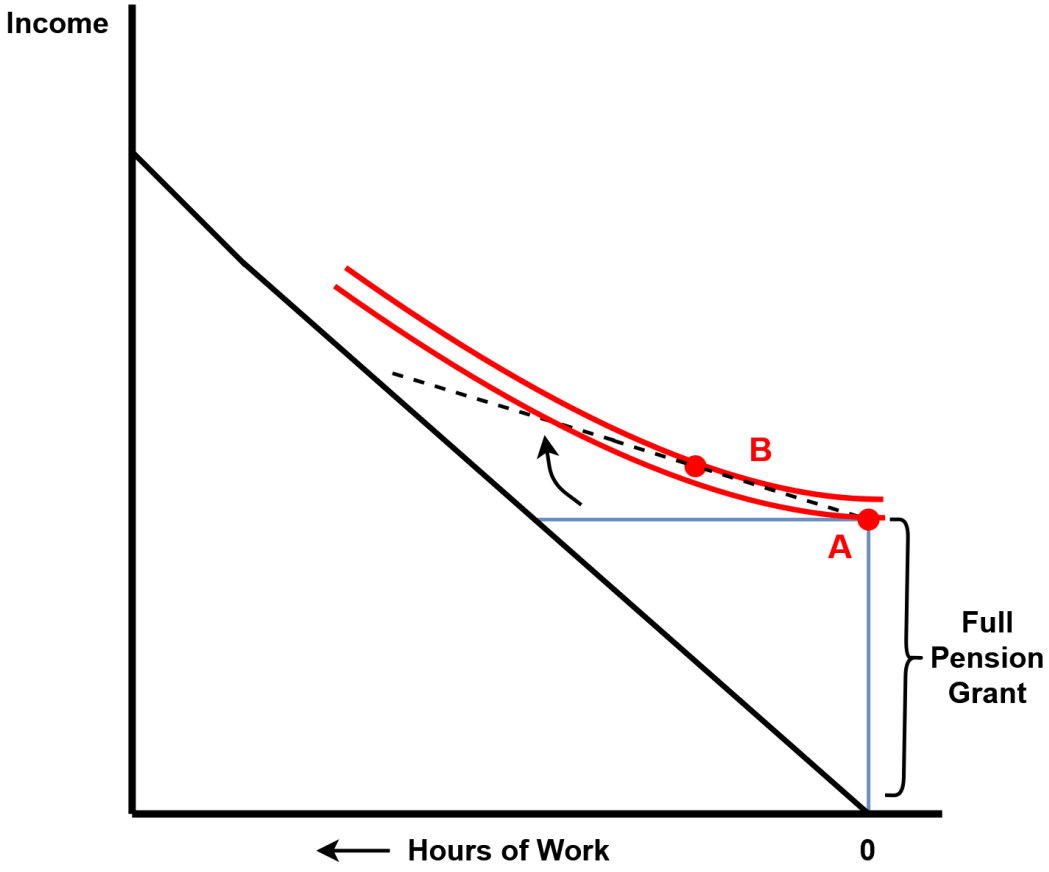
Other authors have also argued that the BOAP should be better targeted. For instance, Jones and Urasawa (2014) state that "One-half of Korea's population aged 65 and over lives in relative poverty, nearly four times higher than the OECD average of 13%. Elderly poverty is thus an urgent social problem. The immediate priority is to target the Basic Old-Age Pension on the lowest-income elderly to ensure that they escape from absolute poverty." Similarly, Byun (2017) states "Given the significant intra-generational inequality … it might be more effective to reduce the elderly poverty if higher benefits were given to the poorer elderly (say bottom 35 percent), while using … intra-generational redistribution from the affluent elderly to the poor elderly."

While a better targeted BOAP would be more effective at reducing poverty, a possible concern is that a high taper rate on earnings would discourage senior citizens from working. This is a key argument that is often made in favour of low taper rates. Indeed, international organizations often advocate low taper rates on pension benefits to encourage work among senior citizens as one way to address population aging. It is important to note however, that the effect of taper rates on labor supply is theoretically ambiguous, and it is even possible for low taper rates to reduce (rather than increase) labor supply. I explain this in the next section.

4. Labour supply effects of means tested pension benefits

Figure 1 illustrates how a higher taper rate in a means-tested transfer program may reduce labor supply. The figure plots income (I) on the y-axis against leisure (L) on the x-axis. The downward sloping straight line is the budget constraint of a typical worker in the absence of any transfer program (and assuming the worker has no other source of non-labor income). Naturally, income falls as leisure increases, so the budget constraint slopes down. If the wage rate is w and maximum possible work hours is T, then the budget constraint touches the y-axis at wT, which is called "full income."[9] As we move to the right, income (I) which is given by the equation is $I = w(T\text{-}L)$, falls by w units for each extra unit of leisure, so the slope of the budget line is $-w$. The budget line touches the x-axis at the point where all time is devoted to leisure ($L=T$) so hours of work are zero $H=0$ and income is zero.

Figure 1: Positive Effect of Taper Rate on Labor Supply



[9] That is, full income is defined as what the worker can earn if he/she devotes all available time to work and takes zero leisure ($L=0$).

Figure 1 also shows how the budget constraint is altered when a means tested transfer is introduced. Now, if the person does not work at all (H=0), they receive positive income equal to the full "grant amount" of the transfer program. As H increases – moving us left in the graph – the grant amount is taxed away at a rate known as the "taper rate." Figure 1 illustrates two cases. The solid line illustrates the case where the taper rate is 100%, meaning that the grant is reduced one-for-one as earnings increase. This causes the budget constraint to have a flat segment, along which working additional hours is not rewarded by receipt of any additional income. Eventually the person works enough hours that the grant is completely taxed away, putting the person back on the original budget line. The dotted line illustrates a case where the taper rate is 50%. Here the grant is only reduced by one-half unit for each unit of earnings, so working additional hours is rewarded by receipt of additional income. As a consequence, the person has to work twice as many hours before the grant is completely taxed away, putting the person back on the original budget line.

Note that the shape of budget constraint illustrated in Figure 1 can arise for a variety of different means-tested transfer programs. If the program in question is a means-tests non-contributory pension plan (like the BOAP or the Age Pension in Australia), then the "grant amount" is the full pension benefit for a person with no earnings. But the same shape of budget constraint can also be created by a negative income tax, where the "grant amount" is the guaranteed minimum income. Or it can be generated by various welfare programs, like the heavily studied Aid to Families with Dependent Children (AFDC) program that used to exist in the United States, where the "grant amount" is the maximum welfare benefit for a person with no income.[10]

Figure 1 plots two indifference curves in income and leisure space for a representative person. When this person confronts the budget constraint with the 100% taper rate, they choose to work zero hours, take full leisure, and receive the full pension grant. However, when the taper rate is reduced to 50%, this person chooses instead to work positive hours. They move to the northwest along the dotted segment of the budget line, and arrive at a point where some but not all of the full pension is taxed away.

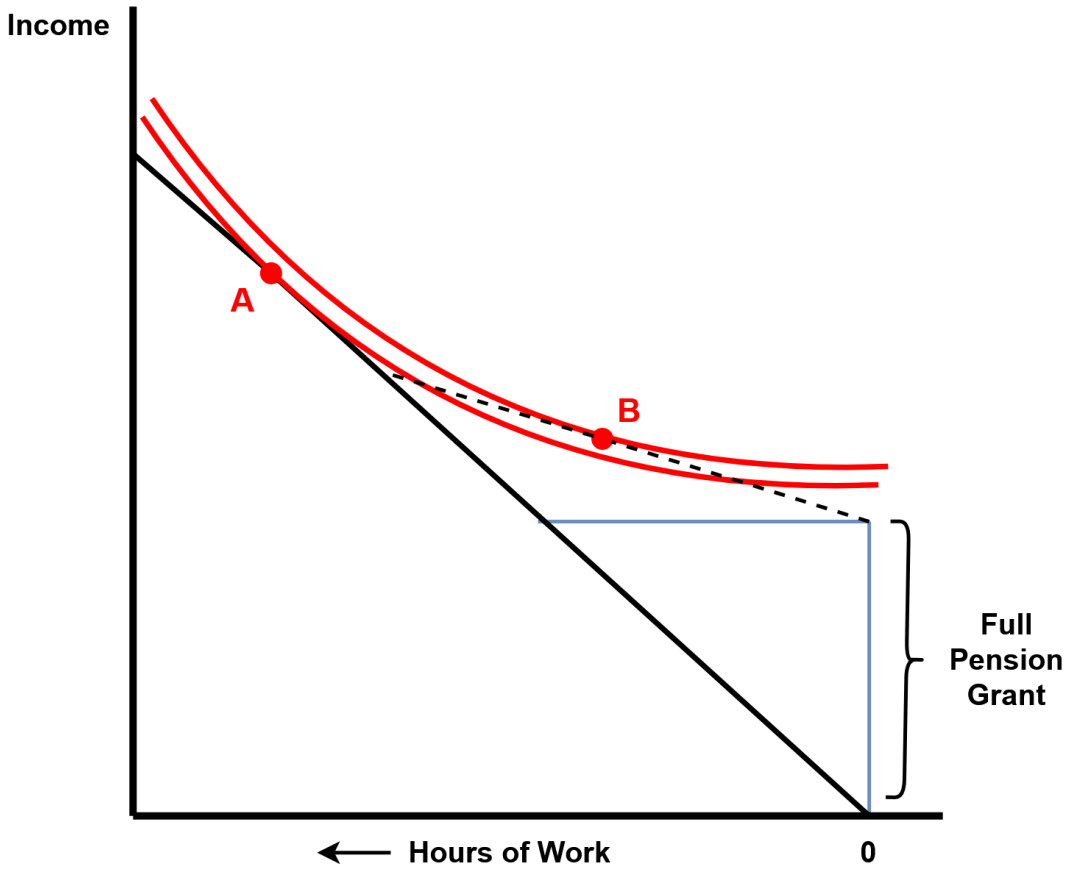
The increase in hours when the taper rate is reduced illustrated in Figure 1 captures most people's basic intuition for how taper rates affect labor supply. It is intuitive that "making work pay" by lowering the taper rate on earnings to less than 100% will induce

[10] The AFDC program was replaced by the Temporary Assistance for Needy Families (TANF) program in the mid to late 1990s. The TANF program is more complex as it incorporates time limits and work requirements, so its impact is not well captured by a static budget constraint.

people to work more. Historically, back in the 1960s and 70s, the heavily studied AFDC program that provided welfare benefits for single mothers in the US imposed very high taper rates near 100%. Some famous scholars like Friedman (1962) and Moynihan (1973) advocated replacing the US welfare system with a negative income tax that would feature a much lower taper rate, arguing that this would encourage work.

Economists have understood since the 1980s that transfer program taper rates have ambiguous effects on labour supply. On the one hand, a higher taper rate may *reduce* labour supply because program participants face higher marginal tax rates if they work. But on the other hand, higher taper rates may also *increase* labour supply, simply because they tend to reduce the fraction of the population who rely on the program, thus causing more people to work.

Figure 2: Negative Effect of Taper Rate on Labor Supply



The potential for higher taper rates to increase labor supply is illustrated in Figure 2. This figure reproduces the same budget constraints graphed in Figure 1. However, in Figure 2 we have drawn indifference curves in income and leisure space for a *different* representative

person. This person's preferences are such that when they confront the budget constraint with the 100% taper rate, they choose to work substantial positive hours.[11] The hours level they choose is high enough that they are not eligible for any means-tested pension benefits. However, when the taper rate is reduced to 50% this person chooses to *reduce* hours to a point where they receive partial pension benefits.

The net effect of higher taper rates on labour supply depends on which effect is greater, the labor supply enhancing effect shown in Figure 1, or the labor supply reducing effect shown in Figure 2. The first formal analysis of this tradeoff, in the context of welfare programs in the United States, was by Moffitt (1985). His results suggested the two effects would roughly cancel. Similarly, in Keane and Moffitt (1998), we found that cutting taper rates in the US AFDC program would not increase labor supply, as the positive effect of lower marginal tax rates is cancelled out by the negative effect of increased program participation. But in any given context it is an empirical question which effect will dominate.

Some authors have also studied the optimal design of negative income tax systems. Example are the classic paper by Mirrlees (1971) and the more recent paper by Saez (2001). The latter papers finds that the optimal tax schedule is a negative income tax system that includes a grant for non-workers (with zero income) that is taxed away at a very high taper rate. As Saez (2001) states "the high rates at the bottom … correspond to the phasing out of the guaranteed income level. … the government should apply high rates at the bottom in order to target welfare only to low incomes."

Notably, high taper (or "phase-out") rates appear more attractive once one considers equilibrium effects. For a given grant level, total costs of a means-tested transfer program to the government will be lower if the taper rate is set higher. Thus, by raising the taper rate and improving targeting, one can reduce program costs and hence reduce the tax rate on program non-participants. This benefits the non-participants directly, and the lower tax rates may also increase their labor supply, benefiting the whole economy.

Finally, the above analysis has focussed on labor supply effects of means-tested pension taper rates in a static framework. If one adopts a life-cycle perspective, it becomes clear that the very existence of a means-tested pension may reduce labour supply over the working life, because the pension benefit reduces the need to save for retirement. This is an 'income' effect. Higher taper rates would reduce this income effect by making the pension

[11] The representative person shown in Figure 2 values leisure (income) relatively less (more) than the person shown in Figure 1.

less generous, thus inducing people to work more.

In summary, in this section I have described four effects of means-tested pension taper rates on labor supply: First, a higher taper may *reduce* labour supply because program participants face higher effective marginal tax rates if they work. This is a 'substitution' effect. Second, higher taper rates may *increase* labour supply, because they tend to reduce the fraction of the population who rely on the program, causing more people to work. This may be called an 'eligibility' effect. Third, a higher taper rate reduces the overall cost of a pension program, allowing the government to reduce the tax on earnings used to finance the program. This may induce a positive 'equilibrium' effect on labor supply. Fourth, higher taper rates may increase lifetime labor supply through the 'income' effect in a dynamic model.

Clearly, the impact of means-tested pension taper rates on labor supply is an empirical question, as it depends on the balance of the four effects described above. In the next section I present some evidence on this question from the Australian context.

5. Some evidence on optimal taper rates in the Australian system

Analogous to Korea, the retirement income system in Australia consists of both contributory and non-contributory components. The contributory component is known as the "superannuation" system.[12] The non-contributory component is a means-tested safety-net pension known as the "Age Pension." The Melbourne Mercer Global Pension Index for 2019 gave the Australian system a B+ rating placing it third in the world, while giving the Korean system a D rating. Despite this substantial difference, the two systems do share one weakness, which is poor targeting of the non-contributory safety-net component:

The Age Pension in Australia has much higher grant levels than the BOAP in Korea, making it much more effective at reducing poverty among senior citizens.[13] But it shares the feature that it is very poorly targeted. According to NCOA (2014) roughly 80% of eligible Australians aged 65 and over receive at least some Age Pension benefit.[14] The rates at which age pension benefits are reduced as seniors have more income and/or assets are quite low, largely due to generous income and asset exemptions. For example, a couple can earn about $75,000 per annum and/or have assets well over $2 million, and still be eligible for some

[12] "Superannuation" is a defined contribution pension scheme. Employers are required to contribute a portion of workers' earnings (currently 9.5%) into privately held "super" accounts. Workers can then draw from the accumulated contributions and earnings in these tax advantaged accounts to help finance their retirement.
[13] Currently the maximum grant amounts are $22,110 for a single person and $33,332 for a couple. The couple rate is set at 41.76% of male average weekly earnings, and the single rate is two-thirds of the couple rate.
[14] See https://www.ncoa.gov.au/report/phase-one/part-b/7-1-age-pension.

benefits.[15] Partly due to this loose means-testing regime, the Age Pension is the largest social welfare program in the Australian federal budget, costing around $50 billion annually.

It is worth emphasizing that the statutory tape rates applied by the Age Pension benefit formal are actually fairly high. During the 2001-16 period, the statutory taper rates applied to the Age Pension benefit were 50% on income and 3.9% on assets ($1.50 per fortnight, or $39 per year, reduction in the pension for every $1,000 of assets), with only the stricter of the two tapers applied. However, the law provides a complex set of exemptions and deductions that enable people to avoid those high rates. The most significant of these is the exemption of the 'principal home' from the asset test. Thus the "effective taper rates" of the Age Pension – i.e., the rates at which program benefits are reduced with income and assets, taking into account available exemptions – are actually much lower than the statutory rates. I would argue that effective taper rates give a better sense of the economic incentives generated by the program, rather than statutory taper rates that people can effectively avoid by utilizing exemptions and deductions (e.g., protecting assets in the form of the principal residence).

In Iskhakov and Keane (2020), we attempt to measure the effective taper rates of the Age Pension. Specifically, we take data from "Household Income and Labour Dynamics in Australia" survey, known as HILDA, from the years 2001-16, and run a regression of the actual Age Pension benefits that people 65 and over received on their income and their total assets – making no distinction among different types of assets. We ran a nonlinear regression that accounts for the fact that only the larger of the income or asset tests is applied.

Our regression results indicate that on average, people's Age Pension benefit is reduced by 27.7 cents for every dollar they earn, and 5 cents for every $1,000 in assets they hold over $117k (with only the larger of the two reductions applied). Thus, the effective taper rate on earnings is 27.7%, and the effective taper rate on assets is 0.5% on assets over a threshold $117,000. Notice how the *effective* taper rates we fit from the data are much lower than the *statutory* taper rates.[16]

In a report released in February 2014, the National Commission of Audit (NCOA), an independent body established by the Australian Government to review a wide range of government programs, recommended that targeting of the Age Pension should be improved through a combination of higher taper rates and reduced asset exemptions. Obviously, higher effective taper rates would improve program targeting, by reducing Age Pension benefits

[15] See https://treasury.gov.au/sites/default/files/2019-03/2015_IGR.pdf.
[16] In fact, the effective rates imply that one can have assets of almost $2.6 million, and/or earnings of about $45,000 per year, before age pension benefits are reduced to zero.

paid to seniors with relatively high income or assets. But, whether such a policy is desirable depends on the labor supply effects. This is an empirical question because, as I discussed in Section 4, the impact of taper rates on labor supply is theoretically ambiguous.

In Iskhakov and Keane (2020) we seek to evaluate how the Age Pension affects labor supply, and to assess whether improved targeting would be a desirable policy. To this end, we build a model of life-cycle labor supply, saving, and consumption that incorporates the main features of the Australian retirement income system.[17] We use the model to simulate the impact of changes in Age Pension rules on both program targeting and labor supply. In this way, we hoped to find ways to improve the design of the program.

Using a dynamic life-cycle model to evaluate a means-tested transfer program like the Age Pension is quite novel. Such programs are typically evaluated using static simulation models, and the literature using dynamic models is very limited.[18] Our dynamic model has a key advantage that it can capture not just how changes in age pension rules affect behavior at ages 65 and over, but at younger ages as well. For example, our model can capture how tighter means tests affect not only labor supply of the 65+ population, but also the labour supply and rates of saving for retirement by younger workers (via the dynamic income effect discussed in Section 4). This is important, as a policy that increases labor supply of the over 65 population may be misguided if it reduces labor supply of younger workers.

A downside of dynamic life-cycle models is they are hard to solve, calibrate and simulate. This means we must introduce some important simplifications of reality to make the modelling feasible: First, we only model the behaviour of male household heads. If we tried to also include women and model the formation of households, it would be an even more complex enterprise that would severely strain current computational limits.

Second, again due to computational limits, we can't model the full complexity of the statutory benefit rules. In particular, it is not feasible for us to model the complex system of income and asset exemptions in detail, especially as they differ depending on household

[17] Our life-cycle model also incorporates several important features of the economic environment that have not been previously captured in one model, including human capital accumulation, liquidity constraints, and the "bunching" of work hours at discrete levels. The fact that people are not typically free to choose any level of work hours, but instead face a constrained choice among a discrete set of hours levels offered by employers, has not previously been incorporated in life-cycle labour supply models.

[18] The two previous papers where dynamic life-cycle models with assets are used to study means tested transfer programs are Keane and Wolpin (2010) and Blundell, Costa Dias, Meghir and Shaw (2016). Both study the AFDC program in the US. Chan (2013) uses a dynamic life-cycle model without assets to study the AFDC program. Kudrna and Woodland (2011) use a dynamic stochastic general equilibrium model with overlapping generations to study the Age pension in Australia. This is a macro model with some life-cycle features.

structure and the types of assets held.[19] Instead, take the nonlinear regression that we fit to the HILDA data on Age Pension benefits (see our earlier discussion) and use it is a relatively simple, but still fairly accurate, approximation to the age pension benefit rule. We then use that approximation within our model in place of the statutory rules.[20]

We calibrate our life-cycle model to fit data on male household heads from the HILDA survey, using the years 2001-2016. The model provides a good fit to life-cycle profiles of consumption, labour supply, wage levels, wage dispersion, wealth profiles, superannuation balances, and annual transition rates between employment states. The good fit of the model to a wide range of behaviors and outcomes gives us some confidence in using it to predict the potential impact of changes in Age Pension rules.

Our model implies that the Age Pension, as currently designed, significantly reduces male labor supply because of the 'income effect'. The program reduces the need to save for retirement, which in turn reduces peoples' incentive to work. To quantify the labour supply effect, we predict that if the Age Pension were entirely eliminated, and the savings used to finance an across the board cut in income tax rates, aggregate labor supply would increase by 5.8%. Our model predicts *most* workers would be better off under this scenario.[21]

Not surprisingly, however, workers at low education and skill levels would be worse off, and these are precisely the people the program is meant to protect. To address this, we next use our model to simulate a doubling of the income and asset taper rates for the Age Pension. This means increasing the *effective* taper rate on earnings from 27.7 cents on the dollar to 55.4 cents per dollar, and increasing the *effective* taper rate on assets from ½ cent on the dollar to one cent per dollar.

Our model predicts this increase in taper rates would increase labour supply of age 65+ college graduates, reducing their dependence on the Age Pension. But the reverse pattern holds for high school dropouts – i.e., they work less at ages 65+ and rely more on the Age Pension. Thus, the increase in taper rates causes the Age Pension program to become better

[19] The key technical problem is that the Age Pension rules treat different assets – such as stocks versus the home versus other real estate – differently. To capture this, that stock of each asset would have to be treated as a separate state variable in our dynamic model, and this would greatly complicate solution and estimation.
[20] If we instead used a more traditional static simulation model we could build in the full complexity of the rules. But changes in Age Pension rules alter people' incentives to work and save throughout their lives, not just their behavior after they reach age 65. Our life-cycle model can account for those changing incentives, while a static simulation model cannot. We think this is an important enough advantage that it is worth simplifying the rules so as to make a life-cycle model feasible.
[21] A important condition for that result to hold is that workers must be aware of the policy change from the time they first enter the labour market, so they can plan their retirement savings accordingly.

targeted towards the low-income population, which is a desirable feature for a means-tested safety net pension.

These patterns are consistent with the labor supply effects discussed in Section 4: For senior citizens with low levels of education the 'substitution' effect of a higher taper rate – illustrated in Figure 1 – tends to be the dominate effect, so when taper rates increase they work less and rely on the pension more. But for senior citozens with high levels of education the 'eligibility' effect of a higher taper rate – illustrated in Figure 2 – tends to be the dominant effect, so when taper rates increase they tend to work more and rely on the pension less.

Our simulations also suggest that a doubling of taper rates would raise enough additional revenue to fund a 5.9% reduction of income tax rates. This is the 'equilibrium' effect discussed in Section 4. According to our model, this reduced tax burden would generates an overall increase in labor supply, particularly for younger workers, as well as increases in consumption. The model predicts that all workers – including low skill workers – would be better off if they faced this environment of higher taper rates combined with lower tax rates – provided that they are aware of the rule change from the start of their working life so they can plan their retirement savings accordingly.

Thus, we predict that a doubling of *effective* taper rates combined with a 5.9% reduction in tax rates would leave everyone better off. It is a Pareto improving policy change. It is worth emphasizing that the only sensible way to increase *effective* taper rates for the pension is precisely by removing exemptions and deductions, for example, by scaling back the main residence exemption. Just raising statutory taper rates obviously can't do much to raise effective rates if one leaves generous exemptions untouched.

These conclusions are subject to a number of caveats. First, mandatory super contributions were introduced in 1992 and the contribution rate was not ramped up to 8% of earnings until 2000. Hence, current retirees were not able to contribute to super for their whole working life. Thus, the current Age Pension program needs to be rather generous because we are still in a transition period where super balances have not reached their full level. However, starting in roughly 2030-2035, we can expect that new retirees who have worked full time for their working life will have made a full 40 to 45 years of super contributions. Thus, it would make sense to gradually increase Age Pension *effective* taper rates over the next 15 years until the program is better targeted as a safety net for the low income population. This is very similar to the NCOA recommendation noted earlier.

Second, recall that our model only applies to male household heads, so one should carefully consider if the proposed policy change would also benefit women. Given that the

consensus of the labor supply literature is that women's labor supply is even more responsive to tax rates than men's (see Keane, 2011), we conjecture that women would also benefit from the combination of taper rate increases and income tax cuts that we propose. But one would obviously want to analyse that conjecture more carefully before changing the rules.

Obviously, one cannot carry the lessons from the Australian context to the Korean context. However, the importance of these results is in showing how a well-targeted means-tested pension can be superior to a system with low taper rates that spreads benefits more widely. The discussion in Section 4 shows that well targeted programs have been found to be superior in other contexts as well.

6. Recommendations to improve BOAP and other anti-poverty programs

As I discussed in Section 3, several authors have advocated that Korea modify the BOAP program to make means tested pension benefits both more generous and more targeted at seniors in absolute poverty. These include Jones and Urasawa (2014), Byun (2017) and OECD (2018a). While a better targeted BOAP would be more effective at reducing poverty, a possible concern is that a high taper rate on earnings would discourage senior citizens from working. This is a key argument that is often made in favour of low taper rates. But based on the analysis in both Sections 4 and 5, which highlights the ambiguous effects of taper rates, I would argue that any concern that high taper rates would discourage labor supply is not likely to be compelling.

Of course, another concern is the budgetary implication of a more generous basic pension. However, OECD (2018a) argues that "The Basic Pension could play a more important role in reducing the high poverty rate among older people in Korea, by better targeting scarce government resources to those with the highest need. More specifically, narrowing the coverage of the Basic Pension to people aged 65 living in absolute poverty would leave room to increase the benefit level for these people significantly, *without affecting government's overall budget* (emphasis added)."

The OECD (2018a) recommends several additional measures to address poverty among senior citizens in Korea. In addition to "targeting the Basic Pension to the most needy and increasing benefit amounts" they also recommend "broadening the coverage and increasing the generosity of the Basic Livelihood Support Programme," or BLSP, and "raising payments for persons over 50 provided by the earned income tax credit and improving the coverage among older self-employed workers."

The earned income tax credit (EITC) is a wage subsidy for the working poor that many countries have found is an effective device for reducing poverty. Korea currently has an EITC program, introduced in 2008, but the benefit levels are too small to be effective. According to the OECD (2018a) "EITC presents rather strict eligibility criteria – notably around the real estate and financial assets requirements contained in the means test – and relatively low benefit amounts equivalent to roughly 2% of Korea's average wage …. For EITC to be a more effective instrument to tackle in-work poverty, notably among older workers in second careers, eligibility criteria and benefit amounts need to be revised."[22]

To put these figures in context, the US also has very small EITC wage subsidies for households without children, but, starting in the mid-1990s the EITC wage subsidy was set to levels in the 30-45% range for households with children. This is in keeping with the traditionally puritanical approach to welfare in the US, whereby benefits are targeted to the "deserving poor," such as widows and children, while benefits to able-bodied single adults and childless households are kept low (see Katz, 1989, Moffitt, 2015). But in the Korean context, where poverty among the 65+ population approaches 50%, having children in the household makes little sense as a criterion for being "deserving" of benefits.[23]

The OECD (2018a) also recommends improvements to the NPS and private pensions. This would reduce elderly poverty in the long run. It would also reduce the number of senior citizens who rely on non-contributory pension and welfare programs (i.e., BOAP and BLSP), reducing the cost of expanding those programs. OECD (2016) recommends that "A three-pronged approach would make the NPS more effective in reducing poverty in the long run. *First,* the number of contributors should be increased. In 2015, insured persons paying contributions to the NPS amounted to 54% of the population aged 18-59, well below the rate in other advanced countries (Lee, 2012). *Second,* the average contribution period, which the NPS projects to average 20.6 years in 2040, should be lengthened to ensure adequate retirement income. *Third,* the targeted NPS replacement rate, should remain at its current 46%... rather than cut to 40% as planned. With an average of 20.6 years of contributions through 2040, the replacement rate would be below 20%, which would be too low to reduce

[22] According to OECD (2016), around 8% of households receive EITC, but spending on the program was only 0.1% of GDP in 2015.

[23] According to OECD (2018a), two-thirds of all EITC households have a head aged 50 or more, and a large proportion (47%) of these older households are single-person households. In 2016, the maximum tax credit ranged from 2.1% of the average wage for singles, to 5.0% for childless single-earner couples and 6.2% for childless dual-earner couples. The average EITC payment in 2016 was only 2.2% of the average wage.

elderly poverty."[24] Similarly, OECD (2018a) recommends "Improving the pension scheme coverage among self-employed and non-regular workers."

These recommendations highlight the low participation rate in the NPS, and the fact that workers typically contribute for much less than the 40-year maximum. The root causes of these problems are Korea's strong seniority wage system and its labor market inflexibility. These in turn, lead to the prevalence of early retirement and a large informal sector. Workers in the informal sector are not covered by the NPS, and it is very common for workers to retire early and enter the informal sector long before making 40 years of contributions.[25] It is difficult to improve the NPS without addressing these core issues.

7. The Korean context is complicated by a seniority wage system and labor market rigidity

The extent of the informal labor market in Korea is remarkable. According to OECD (2018b) "Korea's labour market is segmented between regular workers and non-regular workers, such as fixed-term, part-time and dispatched workers, who account for one-third of employees. Non-regular workers earn one-third less than regular workers on an hourly basis, even though the skills of temporary workers match those of permanent prime age workers on average."

Informality is especially prevalent among older workers. According to OECD (2018a) almost 40% of workers aged 55-64 hold a non-permanent job, compared with an OECD average of just one in every ten. They also explain: "The large majority of workers in Korea retain their main job only up to their early-50s. Upon retiring early, or on an "honorary" basis, many either become self-employed or enter low-quality, precarious and low-paid jobs in sectors ill-suited to the skills and expertise they have built up over their working lives. Many maintain a so-called second career for a decade or two, if not longer, before effectively … retiring in their early 70s."

Prior to 2016, the mandatory retirement age set by firms was 58 on average. But it was much lower in practice, averaging 46 for those who left their main job voluntarily and 53 for those who left involuntarily (see OECD, 2018b). Beginning in 2016, the mandatory

[24] According to OECD (2018a), the target replacement rate after 40 years of contributions was 46% in 2016 and is being reduced by 0.5 percentage points for every year until reaching 40% in 2028 to improve the financial sustainability of the system. The contribution rate started at 3% of monthly income in 1988 and was increased to 6% in 1993 and to 9% in 1998 (shared equally between the worker and the employer. In 2016, the average benefit equalled only about 10% of the average wage (National Pension Service, 2017).

[25] Consider a worker who completes tertiary education at age 22 followed by 2 years of universal military service. Given a typical retirement age of 55, the working life is only 31 years. And not all of that may be spent in the formal sector.

retirement age at firms with over 300 workers must be at least 60, and this will be extended to smaller companies in 2017 (see OECD, 2016). But increasing the mandatory retirement age has little effect when so many workers retire earlier.[26]

What drives early retirement is the seniority wage system. According to a 2012 government survey, all firms use seniority in setting wages, although 60% to 70% also use other criteria, such as individual performance and job status (see OECD, 2016). The seniority wage system causes the wages of workers in their 50s and 60s to exceed productivity, creating strong incentives for firms to terminate their employment. Koh (2018) estimates wage equations for Korea using the Korean Ministry of Employment and Labor's Wage Structure Survey (WSS), for each year from 1980-2016.[27] His Figure 2-2 Panel E plots the estimated marginal effects of tenure by year. The estimates are consistently near 3% per year of tenure, which is remarkably high.[28] According to Lee (2019), "Korean workers who remain at the same workplace for 30 years or more end up making 3.3 times the salary they did when they first joined, compared with 2.5 times for Japan and 1.7 times for Europe."

According to OECD (2016), the problems created by the seniority pay system are exacerbated a relative lack of education and skills among older workers compared to younger workers. They note that "Low education and skills, combined with the seniority-based pay system, creates a significant gap between wages and productivity as workers age, leading to a culture of early retirement."

A second factor that contributes to the large informal sector is the rigidity of the formal labor market, in particular the legal difficulties that can arise in firing regular workers. According to OECD (2018a) "Individual dismissals are allowed for urgent managerial reasons, an ill-defined criterion that is difficult to prove in front of a court. Therefore, layoff costs are difficult to predict for employers and can be high due to long and complex judicial procedures." According to the World Economic Forum (2019) Global Competitiveness Index (GCI), in 2019 Korea was ranked 97th in the world in labor market flexibility, 116th in cost of redundancy, 102nd in hiring and firing practices and 130th in labor/employer relations. These poor rankings in the area of labor market flexibility compare to Korea's strong overall economy ranking of 13th on the GCI.

[26] According to OECD (2018a) "Retention of workers past the age of 60 was extremely low in Korea, with only 23.4% of those employed five years earlier keeping the same employer past age 60, compared with an OECD average of 50.3% in 2016."
[27] These data are considered very reliable as they are based on company records.
[28] Koh (2018) wage equations include a quadratic in tenure, but the quadratic terms are quite small, implying that the marginal effect of tenure declines very slowly as tenure increases.

The OECD (2018a) has suggested a three pronged approach to help break down the dual labor market system. These are (i) "*In the short run, foster the introduction of wage peak systems …," (ii) "Proactively tackle the seniority-centred professional appraisal culture*," and (iii) "*Reduce the uncertainty surrounding dismissal costs [by]* clarifying the definition of unfair dismissal and the modalities of reinstatement in case of unfair dismissal…" The so-called "peak wage system" is meant as a short-term solution until the seniority wage system can be broken down. Under this system, an employer commits to maintain older workers in their jobs longer in exchange for annual wage cuts that begin as the worker approaches retirement age. The wage cuts are partly compensated by government subsidies granted to the employee. The increase in the minimum mandatory retirement age to 60 in 2016-17 has provided an impetus for many firms to implement peak wage systems.[29]

One hinderance in following this peak wage strategy is that the introduction of the system requires consent from trade unions, and as already noted, labor/management relations are very poor in Korea.[30] Another is that the government subsidies provided under peak wage systems are currently very small. According to OECD (2018a), in 2016 the subsidy provided KRW 30.8 billion (USD 26 million) to 6,683 employees.[31] This is only 0.63% of the total expenditure on unemployment benefits. The report recommends increasing the size of these subsidies.

Despite these issues, Yonhap News Agency (2017) reports that, according to the survey by the Korean Employers Federation, "more than half (52.2 percent) of the companies with over 300 employees have introduced the wage peak system." And according to Korea Joongang Daily (2015), a report by the Ministry of Employment and Labor found in a survey of companies affiliated with the nation's top 30 conglomerates (chaebol) that 177 of 378 companies surveyed had adopted a peak wage system. In particular, they note that "The Samsung Group decided in 2014 to adopt the system at all of its affiliates and plans to complete the conversion at all of the workplaces by 2017."[32] The survey found that "About

[29] In 2013, the Age Discrimination in Employment Prohibition and Aged Employment Promotion Act was amended to set age 60 as the national minimum mandatory retirement age. The legislation came into force in 2016 for employers with more than 300 workers and public enterprises, and in 2017 for smaller employers. The legislation also allowed firms to implement peak wage systems starting at age 55.

[30] According to agediscrimination.info, "The introduction of wage-peak systems has been a matter of significant controversy and opposition by labour unions and workers organisations, and the legal question of whether such a policy requires collective employee consent has only recently been definitively resolved by a 2017 Supreme Court decision that concurred with the 2016 Guidelines from the Ministry of Employment and Labor in holding that a company's adoption of a wage-peak system *is* an adverse change requiring employees' majority consent (see http://www.agediscrimination.info/international-age-discrimination/south-korea).

[31] Currently, 1 Korean won equals 0.00084 US$.

[32] The Samsung group is the largest Chaebol, accounting for over a quarter of GDP.

54 percent of the 30 conglomerates' companies have started to cut salaries for employees at age 56 or 57." The typical pay cuts were substantial: "Those aged 60, the usual retirement age, receive an average 40 percent less in salary than they did in their peak earning year. The reduction is an average of 34 percent at age 59, 27 percent at age 58, 19 percent at age 57 and 10 percent for 56-year-old workers."

Despite the widespread adoption of the peak wage system, and the apparently large wage changes involved, there appears to be almost no academic literature that evaluates the impact of this policy on the retirement age, or on labor market duality more generally. There is an urgent need for academic research on the effects of peak wage policies.

Interestingly, the peak wage policy has been sold politically as a way to create jobs for younger workers. According to Higo and Klassen (2017) there is a widespread and persistent belief among politicians, employers, and labor unions that raising the age of mandatory retirement will take jobs from younger workers. But it is felt that paying older workers lower wages will free up funds to hire younger workers. For example, the Korea Ministry of Strategy and Finance (2015) stated that the "peak wage system is designed to guarantee retirement at the age of 60 while at the same time creating jobs for young adults, and "savings in labor costs realized through the peak wage system should be used to hire young adults as new employees." Such claims seem to be based on the 'lump of labor" fallacy. Both theoretical and empirical work is needed to investigate these claims.

8. The Challenge of Population Aging

Any attempt to fight old age poverty by improving coverage and generosity of the Korean retirement income system will run up against serious challenges due to population aging. Korea faces the most rapid pace of population of any country in the OECD. This is due to its very low birth rate (which recently fell below 1.0) and the fact that a large share of the current workforce is approaching retirement. According to the OECD (2018a), "Korea currently has 177 residents aged 65 and above for every 1,000 persons of working age. This ratio – known as the old-age dependency ratio – was considerably lower than the OECD average of 246 in 2015. The figure for Korea, however, is projected to quadruple in the coming decades, exceeding the OECD average by around the year 2025 and peaking at a projected 760 by around 2065 – the highest ratio of any OECD country – according to the latest UN projections."

According to Statistics Korea, as of 2010 the working-age (15-64) population is forecast to shrink to 21.8 million by 2060, which is 59% of its peak of 37.0 million in 2016. It

is forecast that the working-age population will decrease by 0.3 million, or 1 to 2 percent per annum, over the next 45 years. This environment creates serious problems for funding the NPS. Exacerbating the problem is that current NPS recipients are receiving generous benefits relative to their contributions. According to Choi and Shin (2015), the cohorts born between 1930 and 1990 are expected to receive benefits equal to more than twice their contributions in present value terms. This is obviously unsustainable as the dependency ratio grows rapidly in coming years.

Kwon (2019) uses a dynamic stochastic general equilibrium (DSGE) model with overlapping generations (OLG) to study the depletion of the National Pension Fund. In the benchmark model economy, the National Pension Fund reaches its peak in 2030 relative to GDP and runs out of funds in 2049. After that date, when the pension fund becomes insolvent, the NPS shifts from a partially funded system to a pay-as-you-go system and the equilibrium premium rate must jump from its current 9% level to a level of 29.3% in 2050.[33] Kwon (2019) then simulates the increases in the current contribution rate necessary to keep the system solvent for an additional 30 or 50 years. The required contribution rates would be 18.3% and 20%, respectively. The current contribution rate of 9% is well below the OECD average of 18.4% in 2016,[34] so some increase may be politically feasible, although it seems unlikely that an increase of the required magnitude is possible.

Clearly then, part of the shortfall will have to be made up by benefit reductions. The reform of the NPS 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 to 68 by 2048. However, recall that as of 2017 the minimum mandatory retirement age is set at 60. It appears likely that increases in the pensionable age so far above the retirement age will tend to further increase poverty among senior citizens even further.

An alternative and preferable approach to benefit reduction would be to implement means-tests.[35] In a recent paper, Kudrna, Tran, Woodland (2020) show how a means-tested pension with high taper rates can be much more sustainable than a universal pension. The advantages of applying strict means tests to a contributory system like the NPS are analogous to the advantages of applying means tests to non-contributor systems like BOAP. Applying

[33] Historically, the NPS contribution rate was 3%, 6% and 9% for the periods of 1988-92, 1993-97, and 1998 onwards, respectively.
[34] According to OECD (2017) "Mandatory pension contribution rates for an average earner averaged 18.4% in 2016 for the 22 OECD countries that have specific contributions for pensions only."
[35] I have been unable to ascertain whether the NPS has any form of means-test currently.

high taper rates to income and assets allows generous benefits to be targeted at relatively poor retirees, while holding down overall program costs (See the discussion of the advantages of better targeting in Sections 4 and 5). Means testing in the Korean context is likely to be particularly effective given the high degree of income inequality among senior citizens noted by Byun (2017).

Also, as Kudrna et al (2020) note, in a means-tested system, households who rationally respond to greater life expectancies by working and saving more see their pensions automatically reduced because of more binding means tests. This provides additional incentives to self-finance retirement by private means, encouraging households to work and save even more thus, creating a virtuous-cycle that reduces pension costs.

Thus, a means-tested pension system has a built-in stabilization mechanism that contains the increase in costs due to increasing life expectancy. Higher values of the taper rate strengthen this fiscal stabilization mechanism. Furthermore, Kudrna et al (2020) note that earnings ability and life-expectancy are positively correlated. Thus, means-tested systems with high taper rates automatically direct public pension benefits toward lower-skilled, less-affluent and shorter-lived groups of households. The fact that means-testing shifts benefits away from longer lived groups magnifies its stabilizing effect.

The benefits of means-testing rely on the idea that the higher skilled senior citizens can respond to higher taper rates by working more. Kim (2019) provides evidence that many older men in Korea are both capable and willing to work more at later ages. He finds that "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."

9. Conclusion

South Korea has the highest poverty rate among senior citizens in the OECD, and the existing retirement income system does little to address the problem. This is because the system spreads very modest benefits very thinly over a large fraction of the population. For example, consider the Basic Old Age Pension, a non-contributory means-tested benefit for low income seniors. According to the OECD (2018a), "The maximum monthly benefit level [is] … equivalent to 5.5% of the average earnings in 2016 and lower than any other non-contributory basic pension benefit across the OECD." Yet these small benefits are distributed to 2/3 of the population. I have argued that a more targeted program – with higher minimum benefits combined with stricter means testing – would reduce poverty and would likely be welfare enhancing. Similarly, I have argued that applying means-testing to benefits under the

contributory National Pension Scheme (NPS) would make the system both more fiscally sustainable and more effective at reducing old age poverty.

The root causes of the high incidence of poverty among senior citizens in Korea are the rigid seniority wage system and the high level of firing costs. Together, these factors generate a dual labor market, and many workers operate in an informal sector without pension benefits. Furthermore, older workers are typically pushed out of their primary formal-sector jobs in their early 50s, as their wage rates start to substantially exceed their productivity. At that point they often continue to work in the informal sector at substantially lower wage rates. In fact, employment rates among senior citizens are the highest in the OECD, but due to low wages many seniors cannot escape poverty by working.

Given this situation, it seems clear that elderly poverty in Korea cannot be addressed merely by reforming the retirement income system. To address the root causes of poverty, structural reforms are needed to break down Korea's dual labor market. The "peak wage" system, implemented in many forms in 2016-17, is an effort to break down the seniority wage system and extend the length of formal sector careers. But there appears to be little empirical analysis of whether it is having the intended effect. Research on this topic is urgently needed. Another strategy to reduce the number of working poor among senior citizens is to expand the EITC program. Such a program already exists, but the wage supplement of just a few percent is far too small to have any significant poverty reducing effect.

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