Live Long and Prosper?
The economics of ageing populations

Edited by David E. Bloom

A VoxEU.org Book

CEPR Press

Live Long and Prosper? The Economics of Ageing Populations

Live Long and Prosper? The Economics of Ageing Populations

Edited by David E. Bloom

A VoxEU.org eBook

Contents

Part II: Solutions and Policies: The 'Now What'

Foreword

With the slowdown in the growth rate of the world's population, the most significant global demographic trend of the 21st century is population ageing, which is driven by three principal forces: declining fertility, increasing longevity, and the progression of large contingents to older ages. Almost every country is seeing a substantial rise in the share of its population over 60, but very few have the necessary institutions and policies in place to promote economic and social security among older people in a financially sustainable way.

This eBook brings together some of the leading experts in the field to evaluate the wide-ranging impacts of the economics of ageing and to assess future policy implications. The primary concerns of the authors centre on the prospect of future workforce shortages as retirees outnumber new entrants, a decline in the savings rate as the older generation liquidates assets to fund its retirement, economic growth slowdowns due to labour shortages and capital shortages, and surging healthcare expenditures for governments and households due to the rise in costly treatments of old age diseases.

The authors propose several options to tackle these issues, such as an increase in medical personnel and a better understanding of the debilitating effects of old age. There must also be adequate changes in social insurance and pension reform to ensure financial support without creating excessive burdens on state resources. Solutions will vary according to location, taking into account the substantial institutional differences between countries.

The issues raised are undoubtedly considerable, yet not necessarily insurmountable, according to the authors. Significant demographic changes are apt to provoke alarm, yet the associated impacts can be managed by focusing on the need for new or reformed institutions and policies, a combination of public and private changes in behaviour, and continued technological progress.

CEPR is grateful to David Bloom for his editorship of this eBook. Our thanks also go to Anil Shamdasani, Sophie Roughton and Alexander Southworth for their swift and excellent handling of its production.

CEPR, which takes no institutional positions on economic policy matters, is delighted to provide a platform for an exchange of views on this important topic.

Tessa Ogden

Chief Executive Officer, CEPR

October 2019

1 The what, so what, and now what of population ageing

David E. Bloom
Harvard T.H. Chan School of Public Health

This eBook examines selected issues related to the economics of population ageing. The book is divided into sections on (1) the implications and challenges of ageing in terms of individual and aggregate wellbeing (the 'so what' of population ageing), and (2) the options countries and individuals have to address those challenges (the 'now what' of population ageing).

What?

Globally speaking, population ageing is the dominant demographic trend of the 21st century. Never before have such large numbers of people reached the older ages (conventionally defined as ages 65 and up). It took the world over 99% of human history, until roughly the year 1800, to reach a total population of 1 billion – that is, 1 billion people of all ages combined – and we now expect an addition of 1 billion older individuals in just the next 35 years. This sizable accretion will be on top of the 700 million older people currently living on the planet. Notably, the size of the 85+ crowd – the so-called oldest old, whose needs and capacities tend to differ significantly from those who are merely old – is growing especially fast and is projected to surpass half a billion in the next 80 years.

Population ageing is driven by three principal forces: declining fertility, increasing longevity, and the progression of large-sized cohorts to older ages. These three forces operate with different strength in different country groups and over different time frames. But it is the relatively certain progression of large-sized cohorts to the older ages that will make the most significant contribution to future population ageing. For this reason, demographers are more confident in their projections of population ageing than in many other variables they routinely project, such as rates of fertility and population growth (Sudharsanan and Bloom 2018).

Although every country in the world will experience population ageing, there will be considerable cross-country heterogeneity in the progression of this phenomenon. For example, Japan is currently the world leader with 28% of its population aged 65 and over, triple the world average and more than 20 times the share in the United Arab Emirates, which anchors the bottom of the country list.

The most explosive growth in the numbers of older people will occur among countries that are currently classified as middle-income. This fact is unsurprising, as these countries also dominate world population. However, the older population share in middle-income countries is increasing at a much faster rate than in their low- and high-income counterparts. Moreover, in comparison with high-income countries, today's middle-income countries are projected to have appreciably greater real incomes when their older population shares reach comparably elevated levels. This dispels the oft-made claim that developing countries are getting old before they get rich. The implication here is that the population ageing challenge faced by middle-income countries is not predominantly one of having insufficient income to take care of their older people. Rather, it is a challenge of having the necessary institutions and policies in place to promote economic and social security among older people in a financially sustainable way (Sudharsanan and Bloom 2018, Bloom et al, 2015).

So what?

Population ageing is setting off alarm bells all over the world. Some of the alarms take the form of apocalyptic visions of mass numbers of lonely, insecure, vulnerable, abused, and exploited older people, deprived of their dignity, fearfully vegetating in their rockers and wheelchairs, and in holding patterns waiting to die.

Current demographic trends are also agitating some politicians who are trying to understand age patterns in voter preferences and participation rates and are worried that changes in the age structure of the population will make certain policy reforms more difficult, such as raising the pensionable age or reducing benefit payouts to alleviate the stress that population ageing will place on pay-as-you-go pension and health care systems.

Economists are also expressing concerns. These relate to the prospect of (1) workforce shortages as retirees come to outnumber new entrants to the workforce; (2) asset market meltdowns and a drop in the savings rate as older people liquidate their assets and dissave to support themselves in old age; (3) economic growth slowdowns due to labour and capital shortages; and (4) fiscal stress, due for example to rising health care costs owing to the fact that diseases of old age – including cancer, chronic obstructive respiratory

disease (COPD), heart disease, diabetes, and Alzheimer's disease and related dementias – are very expensive to treat, not just medically but also in terms of the requirements of formal and informal care.

Two of the chapters that follow examine the growing labour force of caretakers for the elderly. Kydland and Pretnar find that informal caregiving reduces formal employment among working-age adults, negatively impacting GDP growth in the US. This is due to the significant costs associated with population ageing, particularly in relation to Alzheimer's and other dementias. Bauer and Sousa-Poza adopt a microeconomic approach, examining the impact of informal caregiving on the health and employment of individual caregivers, and find that while the effects are mostly negative, they are relatively small, suggesting that current public policies have been effective in addressing the individual burdens of caregiving.

The chapter by Kotlikoff discusses the consequences of population ageing for countries' and regions' financial health and the global distribution of economic power. This chapter argues that ageing-related long-term fiscal problems will be more severe in the US than among its counterparts in Western Europe, and among China, Japan, and South Korea. This suggests that ageing may play a nontrivial role in shifting the cross-country distribution of economic performance.

The logic behind some economists' concerns with population ageing is that there are strong life-cycle patterns to production and consumption and that older people simply do not produce as much as they consume. One of the sections in this collection examines the reasons for this phenomenon through the lens of the preferences of older workers (Maestas and Jetsupphasuk). The authors find that older workers value schedule flexibility and work autonomy at a high percentage of their wages – and conclude that offering these relatively inexpensive job features may be a way to increase workforce participation among older workers.

The effects of these life-cycle patterns are plausibly large. For example, in economic terms, the value of lost production due to morbidity and mortality from noncommunicable diseases (NCDs) – coupled with the effect of diverting a portion of savings to cover costs of treatment – are equivalent to a roughly 3-10% tax on GDP based on a macroeconomic model calibrated for selected countries out to 2050. That is the same order of magnitude as the UK Treasury's estimated 4-9% effect of Brexit on the size of the UK economy (Bloom et al. 2018). The chapter by Bloom, Chen, Kuhn, and Prettner presents a similar result, finding a cumulative economic burden of more than $32 trillion from NCDs in OECD countries during the years 2015 through 2030; this burden amounts to an annual income tax of 3.55% for the average OECD country.

The chapter by Conesa, Kehoe, Nygaard, and Raveendranathan contends that the economic burden from increasing healthcare costs in the US will be lower if the current trend of increasing college attainment continues. The authors also argue that large fiscal adjustments will be necessary if healthcare costs continue to rise more rapidly than per capita GDP, and that the US will face a difficult choice between eliminating Medicare and Medicaid and increasing tax rates.

In their chapter, Liu and McKibbin examine the effects of population ageing on aggregate savings, investment, real interest rates, and international capital flows. They argue that population ageing will drive capital flows from the more to the less rapidly ageing countries, both within the OECD and between the OECD and developing countries. This suggests that population ageing will significantly impact international financial flows, current account balances and real exchange rates.

These economic effects might be further magnified based on the emerging evidence that populations become more risk averse as they age, which can result in a decreased appetite for entrepreneurial activity (McConnell and Sunde). Also relevant here is McGovern's observation that financial wellbeing at older ages is tied to early-life human capital deficits, suggesting great risk for many prospective retirees. On a more positive note, McGovern's analysis provides further support for policies that help cohorts currently entering the labour market plan for their retirement, such as pension autoenrollment.

On the other hand, we must avoid the pitfall of overstating the challenge of population ageing by underestimating the productive contributions that older adults make to society. For example, even when older people are not working for pay, they are often engaging in non-market activities that create value, such as caring for grandchildren, undertaking volunteer work, or working around the house.

Perhaps the biggest source of uncertainty here has to do with whether population ageing simply involves adding years to life, or also involves adding life to years. In other words, is the rise in life expectancy just a postponement of one's age at death? Or is it a concomitant postponement at the age at which people's minds and bodies break down and they are forced to surrender their functional independence? That is, will higher life expectancy translate into more years of misery and suffering, as we spend more years unable to autonomously perform the normal activities of daily living such as eating, bathing, dressing, grooming, and going to the toilet? In this grim scenario, the state would be burdened with larger and more persistent healthcare and pension liabilities without offsetting tax receipts.

Alternatively, are we living longer with minds and bodies that are also becoming more robust and resistant to decay? Under this circumstance, older adults are able to be productive and function independently for longer periods as life expectancy rises. As such, increased life expectancy represents a bona fide improvement in human welfare and a potential boon to governments in terms of tax receipts relative to social spending. From a social, economic, fiscal, political, and humanitarian point of view, it is hugely consequential whether increased longevity is accompanied by a compression or an expansion of the morbid years. The chapter by Scott examines how we might maximise the economic dividend from a healthful increase in longevity. Unfortunately, debates related to the compression/expansion of morbidity remain unresolved, with the extant analyses nowhere near pointing to a consensus.

Now what?

Many of the chapters herein propose solutions to selected challenges associated with population ageing. The good news here is that there are many options. These range from institutional adaptations and policy reforms related to health and long-term care and its finance, to new technologies and designs. They also cover the spectrum, from behavioural changes related to human capital investment throughout the life cycle to changes in business and human resource practices.

The second section of this collection begins with Eggleston's chapter highlighting the policy importance of measuring the economic value of investments in increased longevity and healthy ageing. Eggleston argues that just as metrics for healthy ageing (for example, healthy life expectancy and quality-adjusted life years) have supplanted previous unadjusted metrics of ageing, so too should improving value of resource use by measuring quality-adjusted medical spending supersede discussion of spending without reference to health outcomes.

Eggleston's chapter is followed by the chapter by Geelhoed, George, Clark, and Strahan which reviews evidence indicating that investments made in early life can influence health and wellbeing as people age, leveraging off the pace of early development and its long-term influence on future outcomes. Early-life interventions may therefore be a beneficial way to ease the fiscal and other pressures of ageing populations.

Various chapters explore solutions to the macroeconomic consequences of population ageing, covering healthcare and health finance. Mahal and Mohanty argue, in the context of India, that recent public sector initiatives to provide expanded hospital coverage to the poor need to be shored up by additional measures to effectively address the growing health burdens associated with population ageing. These include a significantly greater

commitment to higher public funding for health than in the past, improved targeting of households containing the elderly, and efforts to address the serious shortage of medical personnel that currently exist in primary care settings. For the US, McGuire offers a plan for improving health insurance by increasing the efficiency through which enrolees benefit from cost savings achieved through less expensive forms of Medicare coverage. The chapter by Mason, Lee, Lee, and Donehower identifies ways to improve the quality of data and analysis and potential policy reforms to improve generational and gender equity.

Social insurance and pension reform are also the focus of several chapters. Laitner and Silverman suggest a Social Security payroll tax change that would enhance workers' incentives to retire later. Longer careers would generate more private resources for retirement, and more income tax revenues for government support as well. Kudrna and Piggott explore pension reforms that increase reliance on non-contributory means tested pensions. Börsch-Supan discusses controversies surrounding pension reform in Europe, and practical approaches to addressing them.

Is demography destiny?

Although the challenges faced are indeed formidable, the chapters herein suggest they are not insurmountable – a decisive rejection of the view that 'demography is destiny'. Indeed, history shows, and common sense and logical reasoning confirm, that demographic change has a natural and persistent tendency to spur behavioural changes, as well as technological and institutional innovations and policy reforms, that either accentuate favourable demographics or offset negative ones.

This is what ensued when the world population was doubling from 3 to 6 billion between 1960 and 2000. Many dire predictions were made, and they garnered great attention, but the reality is that global income per capita more than doubled during that time frame, life expectancy increased by more than 15 years, and primary school enrolment rates approached universality in many countries.

Population ageing indisputably poses myriad challenges. Spotlighting a number of the options we have for addressing those challenges is one of the main contributions of this volume. The task before us is to figure out which are best to adopt, individually and collectively, and to mobilize the political and social will and the financial muscle to act proactively. In fact, as the chapter by Ferranna pointedly argues, investing in happiness at old ages may improve health and longevity, thereby reducing the socioeconomic burden of ageing populations.

References

Bloom, D, D Canning and A Lubet (2015), "Global Population Aging: Facts, Challenges, Solutions, and Perspectives", *Daedalus* 144:80-92.

Sudharsanan N, D Bloom (2018), "The Demography of Aging in Low- and Middle-Income Countries: Chronological versus Functional Perspectives", *Future Directions for the Demography of Aging*, 11: 309-338, Washington: The National Academies Press.

Acknowledgements

About the author

David E. Bloom is Clarence James Gamble Professor of Economics and Demography at Harvard T.H. Chan School of Public Health and Director of Harvard's National Institute of Aging Demography Center. Bloom also serves on the Board of Directors of the Population Association of America and is a founding co-editor of the *Journal of the Economics of Ageing*. Bloom's current research focuses heavily on the interplay of health, demographics, and economic growth and development. Bloom is an elected Fellow of the American Academy of Arts and Sciences and an Andrew Carnegie Fellow of the Carnegie Corporation of New York.

Dedication

This e-book is dedicated to the memory of Dr. Marc David Mitchell, who passed away on June 25, 2019 at the age of 70. Dr. Mitchell, who earned degrees from Harvard University, Boston University School of Medicine, and MIT's Sloan School of Management, helped pioneer the field of digital global health. He was a visionary thinker, a passionate teacher and adviser, a kind and generous person, and a good friend to many. He will be missed.

Part I: Implications of Population Ageing: The 'So What'

2 Who will care for all the old people?

Finn Kydland and Nick Pretnar[1]
University of California; Carnegie Mellon University

As the populations of developed countries age, the demand for old-age living assistance will increase. At the same time, the relative number of workers to retirees will fall. Together, these facts lead to two related policy questions. First, how will we meet the increasing demand for assisted-living services; and second, what economic trade-offs might policymakers face in doing so? On the face of it, these questions are not insubstantial, especially for the United States. Right now (in 2019) there are approximately 3.2 working-age adults for every person over the age of 65, down from 6.1 in 1950. However, even accounting for migration, this number is projected to fall to approximately 2.0 by 2060 and 1.62 by the end of the century.

As Cooley and Henriksen (2018) and Kydland and Pretnar (2018) point out, there is a significant negative correlation between population ageing and aggregate output (GDP) growth, especially per capita, due in part to changes in the ratio of workers to retirees. This affects the labour supply along two dimensions. First, as the number of retirees increases, the number of workers relative to the population falls. Second, workers beyond a certain age tend to be less productive and work fewer hours. As Figure 1 shows, the growth trends for both GDP and GDP per capita have declined significantly since the 1950s, at the same time as the working-age population ratio has also fallen. Since 1950, declines in the working-age population ratio account for almost 57% of the decline in the average annual GDP growth rate (Kydland and Pretnar 2018). Further, a 1% relative increase in workers to retirees is associated with an approximate 14 basis point increase in the average annual GDP growth rate (Kydland and Pretnar 2018). If the 2017 working-age population ratio were to hold, compounded aggregate output would be 39% higher than otherwise by the end of the 21st century (Kydland and Pretnar 2018). Thus, at a minimum, policymakers should prepare for population ageing to lead to a low-growth future.

When accounting for additional strains placed on health care and social safety systems, the problem of dealing with low growth becomes more complex.

Figure 1   Trend GDP growth and the working-age population ratio have both fallen, and projections suggest this trend will continue throughout the 21st century
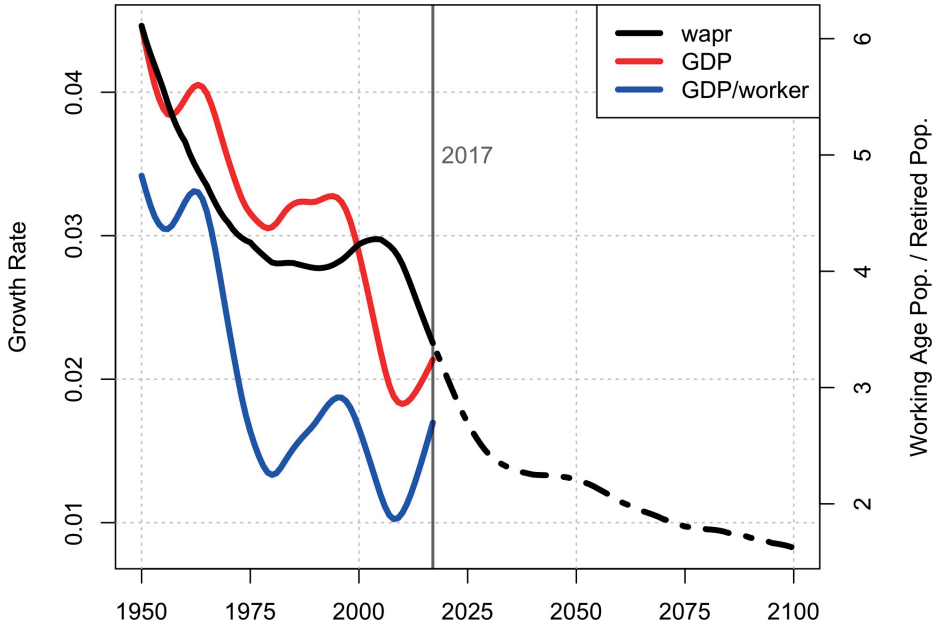
Sources: Population data: United Nations Department of Economic and Social Affairs ; GDP growth: U.S. National Income and Product Accounts (BEA).

According to data from the American Time Use Survey (Bureau of Labor Statistics 2017), the average household with an adult head between the ages of 25 and 65 spends more than half an hour per week providing unpaid care for another elderly adult (Table 1). Adults who provide at least some amount of elder care work over one hour less per week and enjoy four less hours of home time than those who do not (Table 1). If providing elder care is perfectly substitutable with working, then for every 1,000 people over the age of 65, 3.55 jobs for individuals under the age of 65 would cease to exist.

Consider now the effects of such a change: working less results in a reduction in income, resulting in a reduction in investment, resulting in turn in a reduction in both GDP and Social Security, Medicare, and Medicaid tax receipts. Thus, there is less public money to finance formal, nursing home elder care, while working-age adults find themselves further constrained both financially and with their time.

19

Table 1   Time allocation of adults aged 25 to 65

Whole population, N = 82995

	Leisure	Labour	Adult care
Average hours per week	69.642	41.743	0.615
Share of average total time*	0.622	0.373	0.005

Provide positive off-market adult care, N = 9937

	Leisure	Labour	Adult care
Average hours per week	66.150	40.671	5.179
Share of average total time*	0.591	0.363	0.046

Provide no off-market adult care, N = 73058

	Leisure	Labour	Adult care
Average hours per week	70.113	41.887	0
Share of average total time*	0.626	0.374	0

Note: * Total time $7 \cdot (24 - 8)$.

Source: ATUS (Bureau of Labor Statistics 2017)

Given the persistent decline in interest rates linked to ageing (Krueger and Ludwig 2007, Backus et al. 2014, Cooley and Henriksen 2018), households that work less and invest less will face a steeper burden in funding their retirements in the future. If policymakers value the long- run financial wellbeing of working-age adults, a potential solution would be for Social Security, Medicare, and/or Medicaid to reimburse elder care providers at the market rate. In fact, long-run projections suggest that such a policy could lead to approximately 1.7% higher rates of GDP growth by the end of the century, while improving the overall welfare of working-age adults as well as both retirees who require and those who do not require living assistance (Kydland and Pretnar 2018). Such a policy could help mitigate burdens on the nursing home system as well, but not entirely, as formal nursing home care and informal in-home care are evidently not perfectly substitutable (Mommaerts 2017).

While not all elderly adults who require living assistance are afflicted with either Alzheimer's or, more generally, dementia, research by Hurd et al. (2013) estimating the aggregate costs of Alzheimer's provides a useful cross-sectional snapshot of total US costs of care. Total cost estimates for caring for elderly individuals with dementia range from $157 to $215 billion (in 2010 dollars) depending on the method used to impute time value of informal care. Within this range, roughly $11 billion is covered by Medicare, Medicaid, and Social Security, while the remainder includes both out-of-pocket costs paid by afflicted individuals and their families as well as the time value of unpaid, informal care provided by loved ones. Estimates of total time devoted to informal care for persons with dementia are not small in magnitude. The Alzheimer's Association estimates that in 2010, 17 billion hours of unpaid care were provided by loved ones to diseased elders, with over 80% of this time burden born by family members. Further, over 90% of those afflicted with Alzheimer's or dementia receive some form of informal care on top of care provided by professional hospice services. The spillover effects on working-age adults of shouldering this burden represent an additional societal cost. Hurd et al. (2013) estimate that the time-value, in 2011, of informal care provided by family members was between $50 and $106 billion.

Using classic economic modelling and the example of Alzheimer's and dementia as a baseline, we can counterfactually ask how curing such diseases, or at least reducing their incidence, may impact long-run GDP growth and overall welfare. Alzheimer's and dementia force those afflicted to spend an extended, terminal period of their lives requiring living assistance. Hurd et al. (2013) estimate that 14.7% of US adults over the age of 70 had dementia in 2010. Using this estimate as a starting point, we simulate the US economy over the 21st century in the event that the rate of incidence drops exogenously and costlessly to 0 by 2056, assuming the population distribution evolves according to United Nations estimates (Kydland and Pretnar 2018). In this scenario, compounded output is 5.4% higher than the baseline by 2096. This amounts to a relatively modest improvement in average annual aggregate GDP growth of 7 basis points.

But these baseline estimates abstract from the fact that in a general equilibrium environment, finding a cure for diseases like Alzheimer's and dementia requires substantial investment in pharmaceutical research and development. Firms engaging in treatment research invest billions of dollars in multi-year drug development programmes that have, up to the time of writing, all failed. For illustration, attempting (and failing) to develop Alzheimer's drugs that target specific neural proteins has cost the pharmaceutical companies Biogen and Eisai billions in market value.[2]

---

2   www.cnbc.com/2019/03/23/failed-alzheimers-trial-leaves-families-and-patients-heartbroken.html

Are such investments in cures worth it? The answer to this question depends on how willing consumers are to purchase treatments that reduce the risk of contracting welfare-debilitating diseases in old age. While pharmaceutical firms must weigh the risk of investment failure against future profits, one unknown is how willing consumers will be to purchase such drugs. This requires estimation of an unknown demand elasticity for a market that does not yet exist. A young consumer purchasing a potential genetic treatment that can reduce his risk of Alzheimer's later in life faces a trade-off as well: he must decide whether the risk reduction he receives is worth the relative decline in present and future consumption. Thus, consumption-smoothing motives are competing with risk-abatement motives. In a world where risk-reducing treatments existed, policymakers would be able to quantify the degree to which consumers are willing to purchase treatments in order to optimally set things like subsidies for research toward treatment developments. In the absence of a market, however, it is difficult to say how consumers would respond. We should remain cautious before jumping to the conclusion that eliminating welfare-debilitating diseases will greatly improve welfare. Indeed, it may not.

To conclude, US GDP growth rates will be substantially blunted by population ageing throughout the 21st century. Diseases for which the afflicted require living assistance impose substantial costs on society when working-age adults substitute time away from work to care for their elders. Policymakers can modestly reduce market inefficiencies by reimbursing family members for time they spend caring for loved ones. Such a policy can help partially offset burdens placed on nursing homes, while improving both welfare and GDP growth relative to the baseline. Investments in research toward cures require substantial capital resources and are not guaranteed to result in successful outcomes. Further, it is unknown how consumers would engage in markets for cures when and if they do exist. Even if developing such cures were perfectly costless, they would have only a modest impact on long-run welfare and growth. Above all, ageing is the largest driver of declines in long-run growth rates, suggesting that barring a sudden baby boom, slow US growth will likely be the new norm as opposed to an anomaly, regardless of what policies are implemented to affect elder care and disease incidence rates on the margin.

References

Backus, D, T Cooley, and E Henriksen (2014), "Demography and low-frequency capital flows", *Journal of International Economics* 92(S1): 94-102.

Bureau of Labor Statistics (2017), "American Time Use Survey (ATUS)".

Cooley, T and E Henriksen (2018), "The Demographic Deficit", *Journal of Monetary Economics* 93: 45-62

Hurd, M, P Martorell, A Delavande, K Mullen and K Manga (2013), "Monetary Costs of Dementia in the United States", *The New England Journal of Medicine* 368(14): 1326-1334.

Krueger, D and A Ludwig (2007), "On the consequences of demographic change for rates of returns to capital, and the distribution of wealth and welfare", *Journal of Monetary Economics* 54: 49–87.

Kydland, F and N Pretnar (2018), "The Costs and Benefits of Caring: Aggregate Burdens of an Aging Population", NBER Working Paper 25498.

Mommaerts, C (2017), "Are Coresidence and Nursing Homes Substitutes? Evidence from Medicaid Spend-Down Provisions", Working Paper.

United Nations (2017), *World Population Prospects: The 2017 Revision*.

About the authors

Finn Kydland is the Jeff Henley Professor of Economics at UC Santa Barbara, the Richard P. Simmons Professor at the Tepper School of Business at Carnegie Mellon University, the Director of the Laboratory for Aggregate Economics and Finance (LAEF), and a Research Associate with the NBER. He is the recipient of numerous awards, including the 2004 Nobel Memorial Prize in Economic Science (with Edward Prescott).

Nick Pretnar is a PhD candidate at the Tepper School of Business, Carnegie Mellon University. He is a classically-trained economist whose research focusses on household finance. His work in aggregate economics deals with long-run growth and home production in the American economy.

3 Employment and the health burden on informal caregivers of the elderly

Jan M. Bauer and Alfonso Sousa-Poza
Copenhagen Business School; University of Hohenheim

Because of low and falling fertility rates, coupled with rising life expectancy, the proportion of older individuals in most industrialised countries is increasing substantially, with the share of those aged 80 and over in OECD countries projected to increase from around 4.6% at present to over 10% by 2050 (see Figure 1). In 2015, about 52% of this population received long-term care (OECD 2017).

Figure 1   Trends in the share of the population aged 80+, 1990-2050
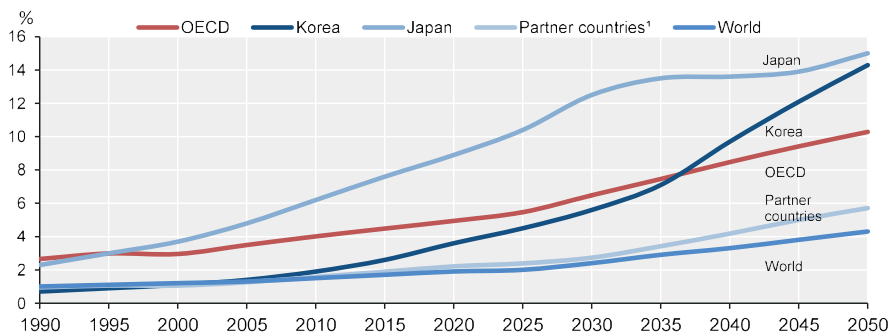
Source: OECD (2017).

This rise in the demand for long-term care (LTC), will be met by a fall in the supply of an important care source, namely, informal caregivers (i.e. family and friends). As parents have fewer children and those they do have become more geographically dispersed and/or career oriented, fewer offspring will be available to provide care for ailing parents, a problem further augmented by the increased labour force participation of women, who traditionally bear the major caregiving burden. Yet with around 13% of those aged 50 and over currently providing informal care at least weekly in OECD countries (see Figure 2), informal care is still the most important source of LTC.

Figure 2   Share of informal caregivers in the population aged 50+, 2015 (or nearest year)
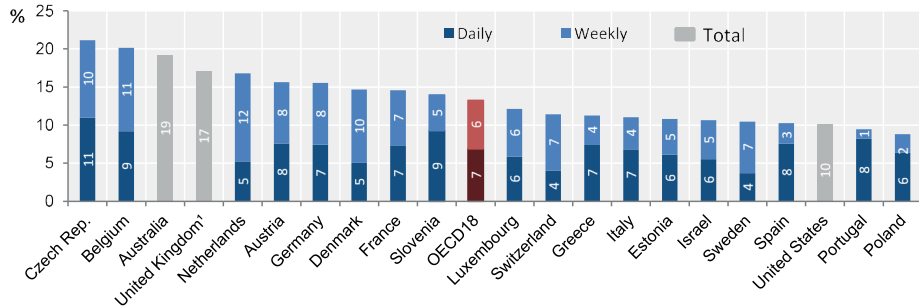
Note: United Kingdom refers to England. Note that the definition of informal caregivers differs between surveys (see OECD 2017 for more detail).

Source: OECD (2017).

Because caregiving is a major responsibility that, although potentially rewarding, is time consuming and often stressful, it has manifold potential effects on caregivers ranging from employment consequences, decreased productivity, and career limitations to higher out-of-pocket costs, poorer health, and possibly even family conflicts (Bauer and Sousa-Poza 2015). Not surprisingly, then, a large interdisciplinary body of literature has evolved that assesses the implications of informal caregiving for caregivers (for reviews, see Bauer and Sousa-Poza 2015 and Keating et al. 2014), with two of the most researched being health and labour market effects.

Labour market implications

The logic underlying the labour market implications of intergenerational caregiving is simple: caring for an older parent or relative is time consuming and usually comes at a stage when the caregivers are at the peak of their careers. Caregiving responsibilities are thus likely to affect employment status (extensive margin) or, at a minimum, the number of hours of paid employment (intensive margin). Yet, a major challenge in determining the labour market effects of informal care is pinpointing the exact causality of this negative care–work association, which has two competing explanations. On the one hand, care is time consuming, so combining it with regular employment is difficult, forcing caregivers to reduce work hours or even quit their jobs to provide the care needed. On the other hand, because unemployed or part-time workers have more time, they are more likely to become caregivers.

Not only are these two lines of causality equally plausible, they are not mutually exclusive and can even occur simultaneously. Hence, although many studies attempt to assess causality (e.g. Bolin et al. 2008, Meng 2012, Van Houtven et al. 2013), the instruments they use to determine causality have been subject to criticism (Hassink and Van den Berg 2011).

Leaving aside such methodological challenges, it is interesting that many studies find little evidence of generally lower employment levels among caregivers, a weak informal care–work relationship that some authors attribute to low caregiver attachment to the labour force, which implies that they would be unlikely to increase their participation in paid employment even without the caregiving burden (Carmichael et al. 2010, Michaud et al. 2010). Nonetheless, the majority of studies provide some evidence that caregivers are less likely to have a paid job, even though the effect tends to be very small (e.g. Bolin et al. 2008). These relatively small effects on the extensive margin may result from a flexible working environment that allows caregivers to adjust their work hours rather than leave the labour force completely. In fact, the evidence that caregivers are more likely to work fewer hours than non-caregivers is also strong, but again with relatively small effects (e.g. Bolin et al. 2008, Kotsadam 2011, Meng 2012). It should be stressed, however, that by covering all forms of care, these analyses are masking the strong effects associated with intense care (i.e. over ten hours per week). In fact, Carmichael et al. (2008) conclude that those who provide care for long hours over a longer period are far more likely to adjust their job participation or leave employment completely. It is also worth noting that the labour market effects for women – who provide care more frequently, at higher intensity, and with higher social pressure to do so (Carmichael and Charles 2003) – are usually stronger than those for men.

Health implications

Although the demands of care provision can be both physical and psychological, several meta-analyses pay particular attention to the psychological implications (e.g. Pinquart and Sörensen 2003a, 2003b, 2006), showing that the majority of studies report a negative association between caregiving and psychological measures. Not only does spending more time on caregiving increase a caregiver's symptoms of depression – with behavioural problems being most dominant in dementia care – but, in line with the 'wear-and-tear' hypothesis of caregiver failure to adapt to the role, caregivers tend to suffer more over time, resulting in decreased wellbeing in the long term (Bookwala 2009).

Although studies on caregiving's impact on physical health are scarcer and have received less attention, they clearly link informal caregiving to physical health outcomes through the following dynamics: (i) caregiving often requires physically demanding work over a long duration, which might cause musculoskeletal injuries and aggravation of arthritis and other chronic illnesses; (ii) caregivers tend to neglect a healthy lifestyle (e.g. diet and exercise); and (iii) caregiving increases stress and lowers psychological health, which is likely to manifest in such physical outcomes as hypertension and cardiovascular disease (Pinquart and Sörensen 2007). The caregivers who suffer the most severe physical impairments tend to be older, male, or in charge of dementia patients (Pinquart and Sörensen 2007). On the other hand, because caregiving can induce a psychological uplift that may increase physical health by enhancing wellbeing, some studies report a positive caregiving effect on both psychological and physical health (Brown et al. 2003). The identification issues of health effects mimic those in labour market research, but are more directly challenged by the complexity of disentangling the effects caused by the actual caregiver role from the consequences of having a close relative in bad and deteriorating health (Bodinac et al. 2010).

Policy effects and responses

In light of the empirical evidence on the labour market and health effects of caregiving, a certain amount of restraint is called for in making policy recommendations. First, not only is there a dearth of research that actually establishes a causal relation between informal care and certain outcomes (especially health outcomes), but the several plausible sources of endogeneity in the empirical analyses (i.e., selection effects and reverse causality) mean that sound policies should be informed only by the most convincing causal analyses. Second, the family support measures already introduced by some countries for caregiving assistance (OECD 2017) – for instance, paid care leave, flexible working schedules, relaxation care, counselling/training services, and sometimes even cash benefits to either caregivers or beneficiaries – undoubtedly influence the impact of caregiving on caregiver health and labour market status. These measures may thus be driving much of the often-inconclusive empirical evidence, which in assessments of caregiving's effects on labour market outcomes or health must take into account the regulations that govern families' care arrangements. For example, in one European analysis (Spiess and Schneider 2003), the negative link between initiating caregiving and working hours is only significant in northern countries, whereas an increase in care hours has a significant influence on work hour adjustment for women living only in southern countries. According to the authors, this pattern reflects a greater ability to substitute in northern Europe, where higher utilisation rates for institutional and formal home care give individuals more choices in the level and

type of care they want to provide. A separate analysis for three European areas – north, central, and south – supports this notion of a north-south gradient along which the effects of caregiving on female employment and work hours are generally smaller in the north than in the south (Kotsadam 2011). Labour force decisions may even differ within the same country based on different work environments and job options (e.g. flexible work hours, telecommuting, or compassionate care leave), prompting a US female caregiver, for example, with access to such arrangements to remain in the labour force (Pavalko and Henderson 2006).

The fact that fewer people provide daily care in countries with stronger formal LTC systems suggests a possible trade-off between informal and formal care, a substitution effect supported by several empirical studies (e.g. Van Houtven and Norton 2004, Bolin et al. 2008). This effect, although mostly small, is characterised by a clear negative correlation between informal and formal care alternatives in both the US and Europe. Bonsang (2009), for example, finds a negative correlation between hours of low-skilled formal care (e.g. housework, shopping, and minor care tasks) and informal care, while high-skill tasks (e.g. nursing care) for severely impaired elderly parents complement informal care weakly. These results, which seem consistent among the nine European countries studied, suggest that in severe care situations, a combination of informal and formal domestic care can avoid the need for nursing home placement. Nevertheless, despite caregiving's potentially negative effects on employment and/or health outcomes, in many countries the support for this extremely demanding activity is woefully inadequate because of an assumption that family care is both available and adequate. Hence, as Wolff et al. (2016) argue for the US, policies and practices need to be developed that make the delivery of person- and family-centred care a reality, including the provision of tailored training and education for caregivers, and appropriate compensation for providers. Over the last decade, novel assistive technologies have emerged with the potential to reduce the caregiver's burden, but these technologies are is still in their infancy and more research is needed to identify their best use in supporting an ageing society (Marasinghe 2016).

References

Bauer, J and A Sousa-Poza (2015), "Impacts of informal caregiving on caregivers: employment, health, and family", *Journal of Population Ageing* 8(3): 113-145.

Bobinac, A, N J A van Exel, F F H Rutten, and W B F Brouwer (2010), "Caring for and caring about: Disentangling the caregiver effect and the family effect", *Journal of Health Economics* 29(4): 549-556.

Bolin, K, B Lindgren, and P Lundborg (2008), "Your next of kin or your own career? Caring and working among the 50+ of Europe", *Journal of Health Economics* 27(3): 718–738.

Bonsang, E (2009), "Does informal care from children to their elderly parents substitute for formal care in Europe?", *Journal of Health Economics* 28: 143-54.

Bookwala, J (2009), "The impact of parent care on marital quality and well-being in adult daughters and sons", *Journals of Gerontology. Series B, Psychological Sciences and Social Sciences* 64(3): 339–347.

Brown, S L, R M Nesse, A D Vinokur, and D M Smith (2003), "Providing social support may be more beneficial than receiving it: results from a prospective study of mortality", *Psychological Science* 14(4): 320–327.

Carmichael, F and S Charles (2003), "The opportunity costs of informal care: does gender matter?", *Journal of Health Economics* 22(5): 781–803.

Carmichael, F, C Hulme, S Sheppard, and G Connell (2008), "Work-life imbalance: informal care and paid employment in the UK", *Feminist Economics* 14(2): 3–35.

Carmichael, F, S Charles, and C Hulme (2010), "Who will care? Employment participation and willingness to supply informal care", *Journal of Health Economics* 29(1): 182–190.

Hassink, W H J and B Van den Berg (2011), "Time-bound opportunity costs of informal care: consequences for access to professional care, caregiver support, and labour supply estimates", *Social Science & Medicine* 74(10): 1508–1516.

Keating, N C, J E Fast, D S Lero, S J Lucas, and J Eales (2014), "A taxonomy of the economic costs of family care to adults", *Journal of the Economics of Ageing* 3: 11–20.

Kotsadam, A (2011), "Does informal eldercare impede women's employment? The case of European welfare states", *Feminist Economics* 17(2): 121–144.

Marasinghe, K M (2016), "Assistive technologies in reducing caregiver burden among informal caregivers of older adults: a systematic review", *Disability and Rehabilitation: Assistive Technology* 11(5): 353-360.

Michaud, P C, A Heitmueller and Z Nazarov (2010), "A dynamic analysis of informal care and employment in England", *Labour Economics* 17(3): 455–465.

Meng, A (2012), "Informal home care and labor force participation of house hold members", *Empirical Economics* 44(2): 959–979.

OECD (2017), *Health at a glance 2017: OECD indicators*, OECD Publishing.

Pavalko, E K and K A Henderson (2006), "Combining care work and paid work: do workplace policies make a difference?", *Research on Aging* 28(3): 359–374.

Pinquart, M and S Sörensen (2003a), "Associations of stressors and uplifts of caregiving with caregiver burden and depressive mood: a meta-analysis", *Journals of Gerontology. Series B, Psychological Sciences and Social Sciences* 58(2): 112–128.

Pinquart, M and S Sörensen (2003b), "Differences between caregivers and noncaregivers in psychological health and physical health: a meta-analysis", *Psychology and Aging* 18(2): 250–267.

Pinquart, M and S Sörensen (2006), "Gender differences in caregiver stressors, social resources, and health: an updated meta-analysis. *Journals of Gerontology. Series B, Psychological Sciences and Social Sciences* 61(1): 33–45.

Pinquart, M and S Sörensen (2007), "Correlates of physical health of informal caregivers: a meta-analysis", *Journals of Gerontology. Series B, Psychological Sciences and Social Sciences* 62(2): 126–137.

Spiess, C K and U Schneider (2003), "Interactions between care-giving and paid work hours among European midlife women, 1994 to 1996", *Ageing and Society* 23(1): 41–68.

Van Houtven, C H, N B Coe, and M M Skira (2013), "The effect of informal care on work and wages", *Journal of Health Economics* 32(1): 240–252.

Van Houtven C H, E C. Norton (2004), "Informal care and health care use of older adults", *Journal of Health Economics* 23: 1159-1180.

Wolff, J L, J Feder, and R Schulz (2016), "Supporting family caregivers of older Americans", *New England Journal of Medicine* 375(26): 2513-2515.

About the authors

Jan M. Bauer earned his PhD from the University of Hohenheim, Germany, in the field of health economics with a focus on aging and elderly care. Studying consumer decision-making in health, sustainability, and well-being, he currently holds the position of Associate Professor in Sustainable Consumption at the Department of Management, Society and Communication at the Copenhagen Business School, Denmark. His research interests in the determinants and consequences of consumer choices are often

interdisciplinary, linking the academic disciplines of Economics, Psychology, and Public Policy.

Alfonso Sousa-Poza holds a Professorship in Economics at the University of Hohenheim in Stuttgart (Germany), and is a Director at the Institute for Health Care & Public Management. He is also an Adjunct Professor at the School of Economics and Finance, Xian Jiaotong University (China) and a Research Fellow of the Institute for the Study of Labour (IZA), Bonn. Alfonso Sousa-Poza is a co-editor and co-founder of the *Journal of the Economics of Ageing*. Alfonso Sousa-Poza studied computer science at the University of Cape Town, and economics at the University of St. Gallen in Switzerland.

4 Ageing in global perspective

Laurence J. Kotlikoff
Boston University

There are three major interconnected, region-specific demographic changes underway across the planet. One is ageing. One is population explosion. One is population implosion. Of the three, the global population bomb is the most striking. The world's total population is projected to increase from 7.8 billion today to 11.2 billion in 2100 – a 44% increase! Most of this population increase will occur in Africa, the Middle East, and India. Africa's population will rise by 3.2 billion, or over two Chinas, by the century's end. The Middle East's population will double, increasing by some 700 million. India, soon to become the world's most populous nation, will add a United States' worth of people. As for the US, its population will grow by one Japan.

For economically significant countries with low fertility and immigration rates – including China, Japan, South Korea, and Russia – population implosion, not explosion, is their 21st century demographic destiny. In 2100, the populations of China, Japan, South Korea, and Russia will be 29%, 33%, 34%, and 18% lower, respectively, than today.

As the world's population expands, it will also age. By 2100, 23% of the people on earth will be elderly (aged 65 or older). Today, that share is 8%.[1] This may seem surprising. How can the world be getting so much older if its total population is expanding so rapidly? Africa is an example of this puzzle. Its population will more than triple by the century's end. But it will also get older. Its elderly share, which is now just 3.7%, will reach 13.4% in 2100. The answer is life expectancy. The world's life expectancy at birth is now 72, heading to 83 over this century.[2] In Africa's case, these figures are 60 and 80, respectively.[3]

---

1   https://population.un.org/wpp/DataQuery/ and www.populationpyramid.net
2   https://www.statista.com/statistics/673420/projected-global-life-expectancy/
3   https://www.futuretimeline.net/data-trends/images/world-life-expectancy-1950-2100-future-trend-larger.jpg

Ageing will be particularly severe in certain countries with extremely low fertility rates. Japan has already aged to a considerable degree. Its elderly population share is now 28%. It will reach 36% in 2050 and decline a bit to 35% in 2100. China is in a very different boat. Only 12% of its population is now elderly. By mid-century, the share will be 26%, and in 2100 the share will equal 34%.[4] South Korea is similarly situated to China. Today, 16% of its population is 65 or older. This share will rise to 35% in 2050 and 36% in 2100.

How will the major regions of the world adjust to these significant demographic changes? One way, perhaps the only way, to address this question is by building a large-scale demographic and economic simulation model that incorporates all major regions of the world. The Global Gaidar Model (GGM), which I co-developed, is such a framework.[5] The GGM is a dynamic, 90-period OLG, 17-region general equilibrium model. Virtually all the countries of the world are combined in the 17 regions; very large countries – such as the US, China, Russia, Canada, Mexico, South Africa, and Brazil – are their own regions.[6]

There are two big questions when it comes to regional population change. First, what will happen to the global distribution of economic power? Second, what stresses will ageing place on specific regions' fiscal finances. The answer to the first question largely depends on the rate at which labour productivity in regions other than the US catch up to the US level. The GGM posits catch-up growth, albeit at a very slow pace, in Africa, the Middle East, India, and other historically slow-growing regions.

The big question about ageing is, of course, whether there will be enough young workers earning enough money to pay for support for the elderly. This support primarily involves pension benefits and healthcare, because none of the regions has sufficiently pre-funded these obligations. Here is where productivity catch-up growth can help.[7] It raises the wage-tax base, providing more revenue to support the older population.

Robots – mechanical workers that never age, that increase over time, and whose productivity can be raised via reprogramming – can also potentially help alleviate labour shortages in ageing societies. On the other hand, they may obsolesce traditional labour and limit the ability of workers to support the aged. Depending on the economic model considerd, robots can be a curse or a blessing (e.g. Benzell et al. 2015). Robots aside, the aforementioned major, intertwined

---

4   www.populationpyramid.net
5   www.populationpyramid.net
6   The GGM features region-specific demographics (including year- and age-specific migration), production technologies, household preferences over consumption and leisure, and fiscal policies. The parameters of the model are carefully calibrated to IMF fiscal data and current and projected UN age-specific mortality, fertility, and immigration rates.
7   The GGM assumes productivity catch up occurs on a cohort-specific basis, i.e., successive cohorts are better educated and, thus, more productive.

demographic forces will change our world in remarkable ways. To begin with, consider the ability of societies that are ageing – whether due to past, current, or projected future lower fertility, mortality, or immigration rates – to maintain their economic position in the world.

Even assuming slow catch-up growth in those regions experiencing explosive population growth, the US share of world GDP falls from 17% today to 5% in 2100.[8] In other words, the US will be to the global economy what Germany is today. What's true for the US is true for today's developed world. Its share of global output falls from 45% today to 15% in 2100.[9]

What about ageing? Will it require, where it occurs, sky-high tax rates to finance government pension and healthcare benefits paid and provided to the elderly? Not necessarily. According to the GGM, tax rates won't rise in the regions ageing most rapidly for three reasons.

First, their assumed catch-up productivity growth will produce greater revenues to help cover the costs of the elderly. Second, many of the ageing regions are quite restrictive with respect to the pension and healthcare benefits they provide to their elderly. Third, the ageing regions typically rely on consumption taxation. Consumption taxation differentially impacts the elderly, whose share of consumption is much larger than their share of income. Stated differently, ageing, where it occurs most dramatically, will expand the expand countries' consumption tax bases substantially.

Thus, the GGM suggests, quite surprisingly, no long-term fiscal problems arising from ageing in China, Japan, South Korea, or Western Europe. Indeed, in each of these regions, consumption tax rates are much lower at the end of the century than at the beginning.[10] According to the GGM, the country with the biggest fiscal problem arising, in large part, from ageing is the US. The share of elderly in the US is now 17%.

---

8   Even if productivity catch up is slower than assumed, the US share of world GDP will shrink significantly.

9   Remarkably, in 2100, Africa will be the world's largest economy, followed by India, the Middle East, and China. Collectively, these regions will account for two thirds of world output. Africa, by itself, will generate 27% of global GDP. The only scenario in which the US maintains its share of world output is one in which there is no productivity catch-up in any region. This is highly counterfactual. Take China – its real GDP per capita is currently growing at 6% per year. It is also unlikely that countries/regions such as South Korea, Southeast Asia, Australia, New Zealand, Canada, and Western Europe, will have living standards that are permanently below those in the US.

10   This suggests the importance of having countries that are ageing but that don't tax consumption, or don't tax it at significant rates, to shift their tax structures towards doing so. This could be done via a progressive personal consumption tax flow tax, which would leave the poor elderly unaffected by the new tax systems.

By 2100, it will be 27%. In the GGM, the US doesn't experience catch-up productivity growth, since all catch-up is relative to the US.[11]

The US also has a very high level of government spending on healthcare and a government healthcare spending profile that's heavily tilted toward the elderly. In addition, it has experienced, and is projected to continue to experience, growth in per capita government healthcare spending that exceeds growth in per capital output. Finally, the savings of Americans, as well as those of the rest of the globe, will be invested largely in countries experiencing rapid labour force and labour productivity growth. Consequently, the US wage base will not expand to keep up with its government expenditure requirements. Indeed, according to the GGM, the US' average rate of taxation on labour earnings will rise over the course of the century by 17 percentage points, from 34% percent to 51%.

This increase is, arguably, very optimistic insofar as the GGM assumes that the US will adjust taxes over time to a) pay for Social Security benefits on a pay as you go basis, and b) adjust income and consumption taxes to maintain the current ratio of debt to GDP. Neither of these things is currently happening. On the other hand, the US may cut Social Security, Medicare, and Medicaid benefits to limit the requisite tax hikes. But these cuts will need to be draconian and immediate if they are to prevent the implied draconian increases in taxes. Gradual policies such as slowly raising the Social Security full retirement age will be too little too late. Taxing wealth, taxing robots, taxing transactions, taxing Social Security benefits at a higher rate than is now scheduled – these and other alternative tax hikes are possible. But whatever one taxes, the combined burden will be little different from that arising under the GGM's assumed tax-adjustment policies.

The upshot of these simulations is that that the combination of demographic change, productivity catch-up, and fiscal challenges spells a relatively rapid end to US economic global hegemony. Indeed, America's economic eclipse will likely be clear by mid-century.

This has far-reaching geopolitical implications. In particular, the US will no longer be able to play the dominant a role in policing global terrorism, in limiting nuclear proliferation, or in curtailing global carbon emissions (were that its desire). Whether it will accept its inevitable second-rate, if not third-rate status without lashing out at perceived rivals, militarily, remains to be seen. But the history of empires suggests they

---

11 It does, however, like all regions, experience secular productivity growth. As described in Benzell et al. (2018), the assumed global rate of secular technological change is 1%, with the change arising via an increase in successive cohorts' time endowments. The US could, of course, experience more rapid technological change than other regions, but there is no evidence this is happening. The US certainly seems to be the world's centre of innovation, at least for now and at least in a majority of fields, but its new technologies quickly spread to other regions.

end with a bang, not a whisper. Hence, while ageing may not be the problem it would seem to be in countries and regions that are ageing most profoundly, it is a major issue for the US and could, as a result, have profound global and generational implications. Moreover, the fact that ageing will put America's fiscal policy under severe stress at the same time as the relative size of its economy is shrinking means that the US government could experience much higher costs of borrowing than is now the case.[12]

Of course, all economic models are flawed and none can perfectly foretell the future. Long-term demographic projections are best guesses, not sure things. As mortality declines, so may morbidity, permitting older workers to remain in the workforce for far longer than is now the case. This process is now beginning to occur in the US. Moreover, the GGM has many explicit and implicit assumptions, including the assumption of full global capital mobility, which some may question. But reasonable changes in the model's assumptions would not likely reverse the main finding for the US that ageing represents a major fiscal problem – a problem that will exacerbate America's loss of economic hegemony.

References

Benzell, S G, L J Kotlikoff, G LaGarda and J D Sachs (2015), "Robots are Us: Some Economics of Human Replacement", NBER Working Paper 20941 (https://kotlikoff.net/wp-content/uploads/2019/04/Robots-Are-Us-NBER-WP-20941_0.pdf).

Benzell, S G, L J Kotlikoff, G LaGarda and and Y Ye (2018), "Simulating U.S. Business Cash Flow Taxation in a 17-Region Global Model" (https://kotlikoff.net/wp-content/uploads/2019/03/Simulating-U.S.-Business-Cash-Flow-Taxation_0.pdf).

About the author

Laurence J. Kotlikoff is a Professor of Economics at Boston University, Fellow of the American Academy of Arts and Sciences, Fellow of the Econometric Society, Research Associate of the NBER, President of Economic Security Planning, Inc., and Director of the Fiscal Analysis Center. He has written 19 books and hundreds of professional articles and op-eds. He is a *New York Times* best-selling author and a frequent television and radio guest. His columns have appeared in *The New York Times, The Wall Street Journal, The Financial Times, The Boston Globe, Bloomberg, Forbes, Yahoo.com, Fortune*, and other major publications.

---

12 When the dollar is no longer the world's dominant currency and the US is no longer the world's dominant economy, trust that the US will be able to repay its borrowing will likely erode.

5 What do older workers want?

Nicole Maestas and Michael Jetsupphasuk
Harvard Medical School

Countries around the world are grappling with the economic and fiscal effects of population ageing, especially slowing labour force growth and rising social insurance expenditures. Many have turned to policies intended to encourage longer working lives. For instance, Austria, Belgium, Denmark, France, Germany, Italy, Japan, the Netherlands, Spain, and the UK have either increased pension eligibility ages or are planning to increase them (Börsch-Supan and Coile 2018, for a discussion of Japan's efforts see Bloom et al. 2018). Meanwhile, the US is in the midst of a scheduled increase in the full retirement age for Social Security benefits from 65 to 67.

While these and related policies surely signal that policymakers wish to shift retirement norms, an important question is whether employers will respond by making jobs available to older workers, and whether older workers will want those jobs. Among older individuals, there exists a substantial degree of unutilised work capacity (Coile et al. 2017, Cutler et al. 2014) – that is, far more older individuals appear to have the physical and mental capacity to work than in fact do work. Coile et al. (2017) show that the percentage of male workers decreases rapidly with age while the ability to work decreases relatively slowly, indicating that for older age groups, there is a substantial and increasing fraction of individuals who could possibly work if they chose. There are several possible reasons for this excess capacity. Many older individuals choose leisure or caregiving over continued work. Others might face employment discrimination against older workers (Lahey 2008, Neumark et al. 2019). Still others might be unable to find the right job match – they might seek job attributes that some employers are unwilling to provide. Recent research sheds light on the latter reason: how do the working conditions experienced by older workers compare to those of their younger counterparts, and even more importantly, what job attributes do older individuals value most?

Working conditions of older workers

The working conditions of older workers are often quite different than those of younger workers. Maestas et al. (2015, 2018a) surveyed a representative sample of US workers about their working conditions. This survey – the American Working Conditions Survey (AWCS) – revealed that across a range of dimensions, job quality tends to rise with age. For instance, compared to younger workers, older workers tend to have jobs that are less physically taxing, less hectic, offer more opportunities to work from home, and offer more independence in determining both work schedule and daily work activities (see Figure 1). Access to paid time off also increases with age. Older workers are less likely to work in teams than younger workers, and when they do work they are more often evaluated on their own performance rather than team performance. Less encouragingly, job training opportunities and opportunities to have an impact on society appear to recede with age. Furthermore, although the percentage with a physically demanding job declines with age, a surprisingly high percentage of older workers (58%) report having a physically demanding job (compared to 63% of younger workers). Similarly, 51% of older workers report being required to work at a fast pace in their jobs (compared to 72% of younger workers).

Figure 1   Differences in selected working conditions by age group
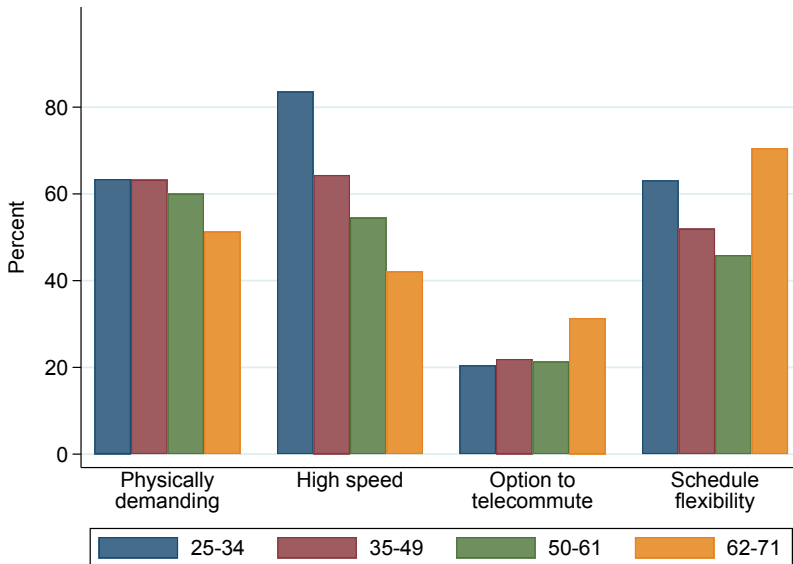
Source: Maestas et al. (2018a).

Comparisons with Europe

The difference in job attributes across age groups is not limited to the US. There is similar heterogeneity in Europe, where working conditions also increase in quality with age. To facilitate cross-country comparisons, the AWCS was based on the long-running European Survey of Working Conditions. As in the US, older workers report slightly less physically demanding tasks, lower work intensity, more opportunities to work from home, and more schedule flexibility (Eurofound 2017).[1] Also, again as in the US, older workers work alone more often than in teams. These differences appear within country as well – for example, in Germany, 38% of older workers have schedule flexibility compared to 29% among the youngest.

Job preferences of older workers

Although job attributes vary across age groups, it is not clear if these differences reflect preferences or selection. For example, those with poor working conditions may disproportionately exit the labour force earlier due to health problems, making it erroneously appear as if working conditions improve with age. Or there could be other differences between older and younger workers that result in older workers having better job attributes, such as the fact that older workers tend to have greater work experience.

Recent research uses stated preference experiments to disentangle preferences from selection effects, finding that not only do older workers have somewhat different jobs, but they also have stronger preferences for certain job attributes than younger workers. Maestas et al. (2018b) identified nine non-wage job characteristics that likely matter to workers based on an extensive review of the literature: schedule flexibility, telecommuting, physical job demands, pace of work, autonomy at work, paid time off, working in teams, job training, and opportunities for meaningful work. To estimate the value of each job characteristic across age groups, they asked a representative sample of Americans to state their preferences between hypothetical jobs with varying working conditions and wages. In each experiment, respondents were presented with two job profiles that consisted of wages, hours, and other job characteristics, all of which varied randomly. The respondents were then asked to state their preference between these two job profiles. The experiment was repeated ten times. In some scenarios, job attributes were anchored to the respondent's actual job to present realistic hypotheticals. In others, the job profiles were randomised around a common baseline job profile.

---

1   See also https://beta.ukdataservice.ac.uk/datacatalogue/doi/?id=7363#!#7.

Using the resulting choice data, the authors estimated the average willingness-to-pay for each job attribute as a percent of the respondents' wage, separately by age group (see Figure 2).

Figure 2   Estimates of willingness-to-pay for job amenities by age group, expressed in proportion to respondent wage
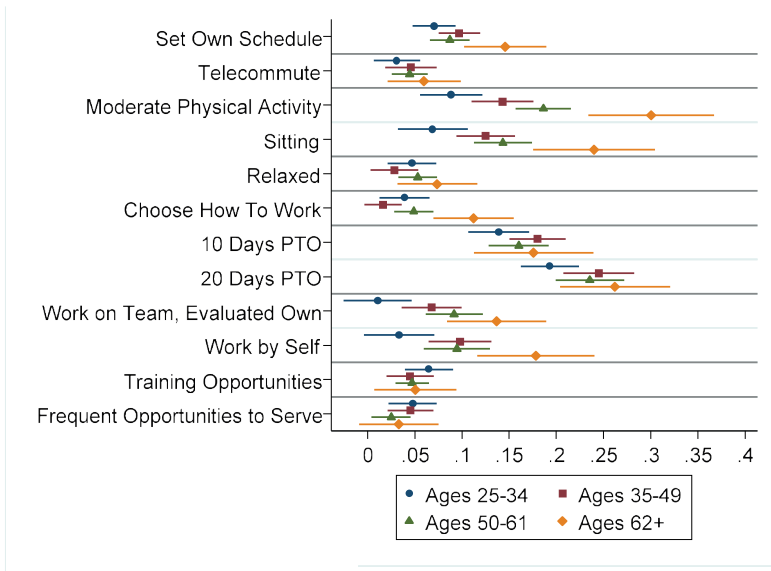
Source: Maestas et al. (2018b)

Among older workers, paid time off is one of the most desirable amenities. Workers aged 62-71 are willing to pay an estimated 18% and 26% of their wages for 10 and 20 days of paid time off, respectively. Paid time off is also highly valued by younger workers – at 14-18% of their wages for 10 days and 19-25% for 20 days. Older workers value moderate physical activity (over heavy physical activity) at 30% of their wage, while younger workers are willing to pay just 9-19% percent of their wages – an especially large difference of 11-21 percentage points. Similarly, older workers value sitting at 24% while younger workers value it at 7-14% – a difference of 10-17 percentage points. The oldest age group also places disproportionate importance on schedule flexibility and control over work activities. The ability to set one's own schedule is valued by the younger three age groups at a 7-10% increase in wages, whereas it is valued by the oldest age group as a 15% wage increase. Similarly, autonomy is estimated to be worth 2-5% of wages for the younger three age groups and 11% for the oldest group. There are also substantial differences in desire to work alone; the estimated wage difference ranges from 3% for the youngest age group to 18% for the oldest. Overall, older workers value job amenities much more than younger workers.

For instance, the difference between the best (all amenities) and worst (no amenities) job profiles was estimated to be equivalent to a 48% wage increase for the 25-34 age group but a sizeable 74% wage increase for the 62-71 age group.

Job preferences among retired individuals

Job attributes also matter to people who have left the labour force. Among older people not in the labour force (the majority of whom were retired), 38% said they would return to work if given the right opportunity (see Figure 3) (Maestas et al. 2018a). Among these respondents, over 80% reported that control over their schedule, the right number of hours, and control over pace of work were important or essential in thinking about possible work in the future. They also ranked lack of physical tasks and work autonomy as important a large percentage of the time – 62% and 77%, respectively. Tellingly, only 54% viewed the ability to provide for themselves financially as important or essential, suggesting that job amenities may be a particularly strong lure for attracting older workers back into the workforce (particularly those with access to retirement income). Further, leaving retirement to re-enter the workforce is a relatively common occurrence in the US, with 32% of employed workers ages 62-71 report having previously retired (Maestas et al. 2018a). Combined with the willingness-to-pay estimates described above, these data provide more evidence of the potential value in leveraging working conditions to entice older individuals to work.

Figure 3   Willingness to work given right opportunity by age group
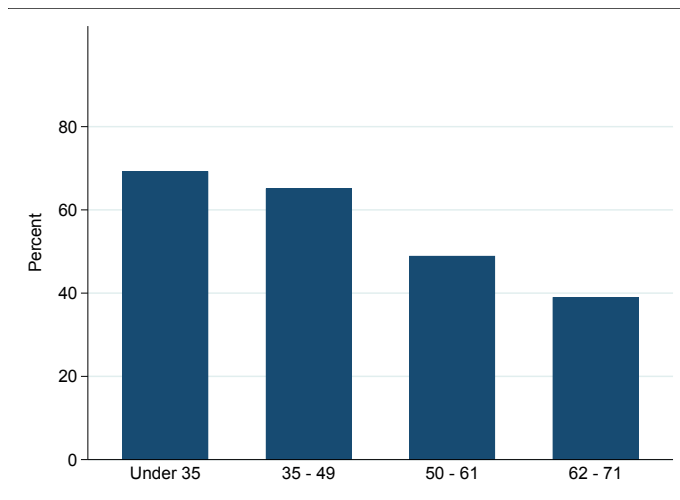
Source: Maestas et al. (2018a).

Conclusion

Population ageing creates a challenging problem worldwide. As countries age, the pool of available workers grows at a diminishing rate as more and more older workers exit the labour force. Consequently, economic growth slows and social insurance programmes such as Social Security become more costly. As countries consider a wide portfolio of solutions, one cost-effective and simple way forward may be to nudge employers to offer the types of jobs that older individuals value. Many older individuals indicate a willingness to work given the right opportunity just as employers are struggling to find enough qualified workers. Older workers appear to value amenities such as schedule flexibility and work autonomy at substantial percentages of their wages – rates that are probably higher than what it would cost many employers to offer them. Offering these less costly amenities might be an efficient way to attract older individuals and alleviate some of the economic pressures of population ageing. Importantly, there are few, if any, tradeoffs to this approach. Employers will have a larger pool of workers to choose from, older individuals who want to work will have the opportunity to do so, and society will benefit from increased economic growth.

References

Bloom, D E, P Kirby, J P Sevilla, and A Stawasz (2018), "Japan's age wave: Challenges and solutions", VoxEU.org, 3 December.

Börsch-Supan, A and C Coile (2018), "Social Security Programs and Retirement Around the World: Reforms and Retirement Incentives – Introduction and Summary," NBER Working Paper 25280.

Coile C, K Milligan, and D Wise (2017), "Health capacity to work at older ages: evidence from the U.S.", in D A Wise (ed.), *Social Security Programs and Retirement around the World: Reforms and Retirement Incentives*, NBER.

Cutler, D M, E Meara, W F Powell, S Richards-Shubik (2014), "Health and work capacity of older adults: Estimates and implications for social security policy", working paper.

Eurofound (2017), "Sixth European Working Conditions Survey – Overview report (2017 update)", *Publications Office of the European Union*.

Lahey, J N (2008), "Age, women, and hiring: An experimental study", *Journal of Human Resources* 43(1): 30-56.

Maestas, N, K Mullen, D Powell, T V Wachter, and J B Wenger (2015), "The American Working Conditions Survey data", *RAND Corporation*.

Maestas, N, K Mullen, D Powell, T V Wachter, and J B Wenger (2017), "Working conditions in the United States: Results of the 2015 American Working Conditions Survey", *RAND Corporation*.

Maestas, N, K Mullen, D Powell, T V Wachter, and J B Wenger (2018a), "The American Working Conditions Survey data", *RAND Corporation*.

Maestas, N, K Mullen, D Powell, T V Wachter, and J B Wenger (2018b), "The value of working conditions in the United States and implications for the structure of wages", NBER Working Paper 25204.

Neumark, D, I Burn, P Button (2019), "Is it harder for older workers to find jobs? New and improved evidence from a field experiment", *Journal of Political Economy* 127(2): 922-970.

About the authors

Nicole Maestas is an Associate Professor of Health Care Policy at Harvard Medical School and Director of the National Bureau of Economic Research's Retirement and Disability Research Center. Her research addresses the economics of aging, disability insurance, and health care. In current work she is examining how population ageing affects economic growth and how working conditions affect individuals' ability and desire to sustain employment at older ages. Dr. Maestas received her M.P.P. in Public Policy from the Goldman School of Public Policy at UC Berkeley, and her Ph.D. in Economics also from UC Berkeley.

Michael Jetsupphasuk is a research assistant for Nicole Maestas in the Department of Health Care Policy at Harvard Medical School. He received his B.A. in Economics and his B.A. in Statistics from UC Berkeley.

6 The flip side of "live long and prosper": Noncommunicable diseases in the OECD and their macroeconomic impact

David E. Bloom, Simiao Chen, Michael Kuhn and Klaus Prettner
Harvard T.H. Chan School of Public Health; Heidelberg University; Vienna Institute of Demography; University of Hohenheim

While modern chronic disease epidemics don't induce the same level of dread as plague, smallpox, and tuberculosis once did, they have long since passed infectious disease as the world's top killer. In 2018, noncommunicable diseases (NCDs) resulted in 41 million deaths globally, or 71% of all deaths (WHO 2018). Across all regions and levels of development, the burden of NCDs – which include cardiovascular disease, cancer, chronic respiratory disease, diabetes, and mental health disorders – is rising (Bloom et al. 2011a, 2014, 2019, Chen et al. 2018).

The main causes of these illnesses can be summarised as the flip side of rising life expectancy and higher income. The modifiable risk factors are mainly smoking, unsafe alcohol consumption, an unhealthy diet, and a sedentary lifestyle (WHO 2018). The latter two risk factors tend to be more prevalent in high-income countries, whereas some progress has been made against smoking and alcohol (Gneitling and Schmitz 2016).

Behavioural changes can influence modifiable risk factors and therefore, at least to some extent, so can economic policies such as taxation, regulation aimed at reducing the consumption of cigarettes, alcohol, and other unhealthy goods or on selected advertisements, subsidies for healthy behaviour, and city planning to encourage cycling and walking.

Ageing is the main non-modifiable risk factor for NCDs. Unlike modifiable risk factors, which can be influenced by policies, past trends in fertility and life expectancy very much determine the population's future age structure (Preston et al. 2000, Preston and

Stokes 2012). Our projections, which are based on World Population Prospects (United Nations 2017) and displayed in Figure 1, indicate that the fraction of inhabitants who are 65 years or older will increase substantially in 2015–2030 in all OECD countries. Comparing the blue circles, which indicate the share of 65+ inhabitants in 2015, with the grey circles, which indicate the projected share of 65+ inhabitants in 2030, clearly shows this trend. Thus, the evolution of the main non-modifiable risk factor shows that the fight against NCDs is an uphill battle.

Figure 1   Share of 65+ inhabitants in all OECD countries
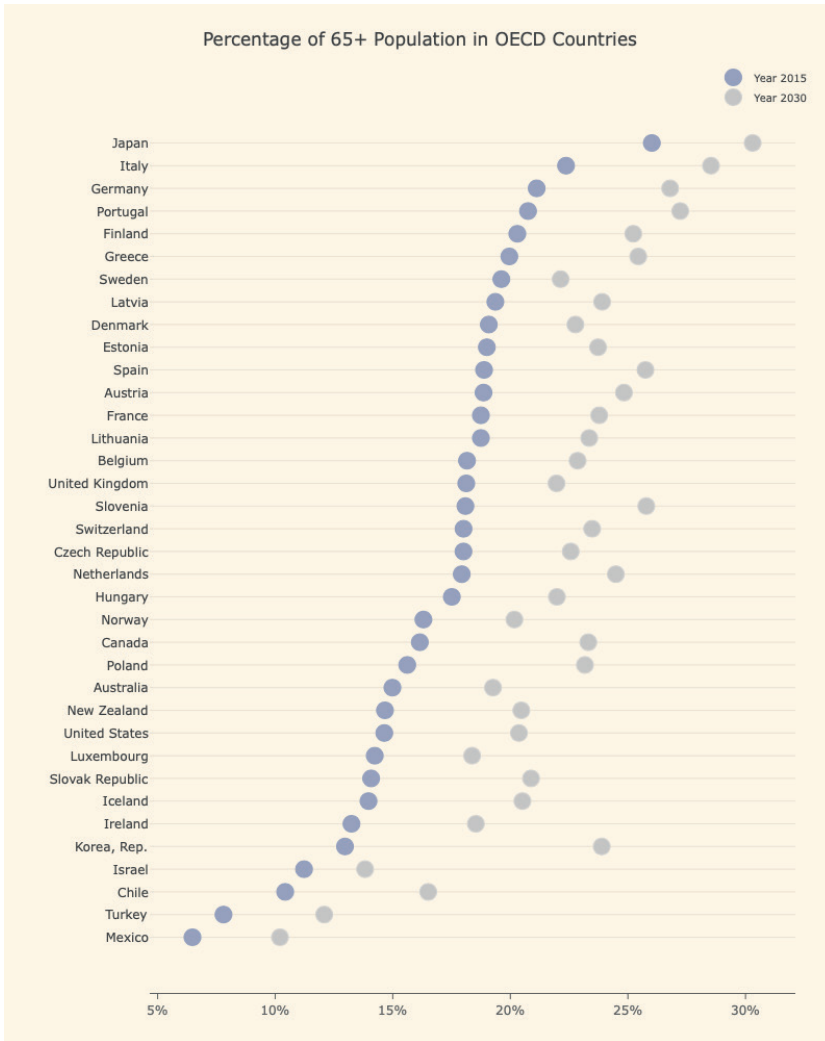
Source: Blue circles = 2015; grey circles = 2030.

NCDs' economic burden in the OECD

Beyond the enormous human burden of pain and suffering, NCDs also inflict a heavy toll on national economies. Treating NCDs is expensive and decreases the resources available for investments in infrastructure, education, research and development, and other important domains. In addition, NCD morbidity and mortality reduce labour supply and decrease the productivity of the chronically ill who remain in the workforce.

Our estimates are based on a macroeconomic model we developed recently with Mark E. McGovern and Les Oxley (Bloom et al. 2019). This model takes into account three main pathways through which NCDs bear on GDP: the loss in effective (i.e. education- and-experience weighted) labour supply due to mortality and morbidity as well as the loss in saving and, thus, in capital accumulation due to treatment costs. For the last channel we assume that treatment costs are financed from savings, as opposed to consumption, in proportion to an exogenous saving rate that we take from the data. Table 1 summarises our results, which indicate a cumulative economic burden of more than $32 trillion from all NCDs in all OECD countries over the time period 2015– 2030.[1] This burden is equivalent to an annual income tax of 3.55% and a per capita loss of more than $24,000 for the average OECD country. As far as specific conditions are concerned, cardiovascular diseases account for $4.25 trillion, cancer for a little more than $4 trillion, and mental health conditions for $3.1 trillion.

Table 1   Economic burden of NCDs in the OECD

Disease category	GDP loss (billion USD)	Tax rate (% of GDP)	Per capita loss (USD)
Cardiovascular diseases	4,266	0.47%	3,210
Chronic respiratory diseases	1,867	0.20%	1,404
Diabetes mellitus	1,487	0.16%	1,119
Mental health conditions	3,127	0.34%	2,353
Cancer	4,090	0.45%	3,077
All NCDs	32,167	3.54%	24,205

Note: Second column = absolute loss in billion US dollars; third column = loss as a percent of aggregate GDP; fourth column = per capita loss in US dollars.

---

1   The total economic burden of NCDs in OECD countries is 32.2 trillion in 2010 constant USD and about the same - 32.4 trillion - after adjusting for purchasing power.

Table 2 shows the extent to which NCDs' economic burden affects OECD countries. From an absolute perspective, the US, Japan, and Germany face the greatest burden ($15 trillion, $32 trillion, and $2.4 trillion, respectively). This is not surprising because they are large and rich countries such that i) many people are affected by the diseases, and ii) the death or disability of a person implies a high per capita income loss. Expressed as a tax on economic output, the US again comes in first with 4.81%, followed by Germany (3.60%) and Ireland (3.50%). Ireland's burden as a tax rate is high because of the country's very high saving rate (37%), compared with the OECD average of 20% (World Bank 2018). The high saving rate implies that, as compared to a country with a lower saving rate, out-of-pocket expenditures for medical treatment reduce saving/investment – and therefore economic growth – by more. The per capita burden, in turn, is highest in comparatively rich countries with a small population, such as Ireland ($51,321), Norway $51,110), and Luxembourg ($49,748). Finally, the last column of Table 2 contains the percentage of the economic burden that originates in treatment costs.[2]

Economists' standard cost-of-illness approach counts the costs of treating disease as a macroeconomic burden. By contrast, the approach we apply defines the macroeconomic burden as the portion of treatment costs that are financed out of savings that would otherwise have been used for the accumulation of capital. As a result, the share of the economic burden attributable to treatment costs depends not only on the price of medical services but also on the country's propensity to save. For example, the US does not rank highly in terms of share of economic burden attributable to treatment costs even with relatively high costs for medical services (16.8% of GDP as of 2015). This can be explained by its relatively low saving rate (around 18% in 2015) compared to that of countries such as South Korea (around 36% in 2015).

Table 2   Economic burden of all NCDs in all OECD member countries

Country	GDP loss (billion USD)	Tax rate (% of GDP)	Per capita loss (USD)	Share of treatment costs
Australia	758	2.94%	29,049	34.4
Austria	208	2.67%	23,589	36.0
Belgium	237	2.59%	20,256	31.1
Canada	1,007	2.98%	26,253	29.1
Chile	143	2.76%	7,610	43.2
Czech Republic	126	2.75%	11,857	32.1

---

2   Note that our estimated loss of labor supply is conservative as we do not assume that the retirement age will be increased in the counterfactual scenario of disease elimination.

Country	GDP loss (billion USD)	Tax rate (% of GDP)	Per capita loss (USD)	Share of treatment costs
Denmark	194	3.07%	33,260	31.0
Estonia	17	3.48%	13,270	21.7
Finland	117	2.55%	20,894	28.3
France	1,247	2.47%	18,258	31.9
Germany	2,457	3.60%	29,847	29.5
Greece	72	1.63%	6,503	24.9
Hungary	87	2.98%	9,116	23.4
Iceland	10	3.09%	29,993	16.6
Ireland	254	3.50%	51,321	47.6
Israel	168	2.93%	18,632	34.2
Italy	783	2.19%	13,300	29.0
Japan	3,230	3.12%	25,795	36.0
Korea, Rep.	808	3.20%	15,602	43.8
Latvia	18	3.06%	9,763	14.2
Lithuania	28	3.15%	10,057	29.7
Luxembourg	30	2.43%	49,748	27.3
Mexico	509	2.15%	3,708	44.3
Netherlands	537	3.19%	31,062	36.3
New Zealand	108	3.14%	21,894	27.2
Norway	284	3.31%	51,110	42.5
Poland	332	2.84%	8,841	32.1
Portugal	90	2.13%	8,881	21.0
Slovak Republic	67	3.13%	12,356	34.3
Slovenia	26	2.51%	12,535	25.0
Spain	643	2.36%	13,884	32.8
Sweden	333	3.22%	32,459	43.8
Switzerland	403	3.48%	45,828	34.2
Turkey	483	2.10%	5,722	38.9
United Kingdom	1,382	2.82%	20,287	22.0
United States	14,974	4.81%	44,390	31.9

Note: Second column = absolute loss in billion US dollars; third column = loss as a percent of aggregate GDP; fourth column = per capita loss in US dollars; fifth column = share of the economic burden that originates in treatment costs.

Policy challenges

All of this is clearly bad news – and the worst news is that the problem will not improve any time soon unless the most important chronic disease risk factors are addressed. These include smoking, unhealthy consumption of alcohol, and a mounting obesity epidemic fuelled by increased consumption of fast, starchy, sugary, and saturated fat-laden foods and decreased physical activity (WHO 2014). The good news is that OECD countries can take several steps to mitigate the worst effects of the ongoing chronic disease epidemic and reduce the future burden of NCDs (Bloom et al. 2011b). Taking these steps should result not only in improved health outcomes for the people living in the OECD, but also in more robust economic growth.

Reforming the health system to emphasise prevention and early detection of disease, including greater investment in vaccines and screenings, is a good first step. For example, the hepatitis B vaccine can prevent liver cancer. Therapeutic vaccines, which utilise a patient's own immune system to induce antiviral immunity after infection occurs, are under active development (Dubensky and Reed 2010). Technological innovation within the health sector can also play an important role. Advances in digital health and personalised medicine can result in improved treatment and care of the chronically ill.

However, health policy changes alone are not enough. Achieving meaningful improvements in outcomes will require dedication to significant and coordinated change in policies, behaviours, and resource allocation across several public- and private-sector services and institutions. Elected officials can institute fiscal policies that discourage unhealthy behaviours (for example, by taxing sugary drinks and junk food) while encouraging healthy ones. Ministries of agriculture can help ensure the supply and provision of healthy foods. Urban planners can design cities with more green spaces, bike lanes, and pedestrian-friendly spaces to promote more physically active lifestyles. Businesses that are interested in keeping their employees healthy and productive can also play a part by sponsoring wellness clinics and health clubs on company sites and offering insurance plans with special benefits to those who eat well and exercise.

Interventions that address early-life risk factors for chronic disease, such as childhood obesity, can be especially impactful and offer a high return on investment. This is because poor childhood health is associated with myriad adverse consequences throughout the life cycle (Case et al. 2005, Currie et al. 2010). Taking measures to curb the consumption of sugar-sweetened beverages and other high-calorie, low-nutrient foods is a good place to start, as is ensuring that all children have sufficient time and space for exercise in their daily lives.

Conclusions

Understanding what needs to be done is not the same as doing what is needed. And in the case of combating NCDs and the risk factors that precede them, making the necessary changes – whether in the realm of governmental policy or individual behaviour – will not necessarily be easy. Nevertheless, OECD countries must be prepared to make these changes if they want their people to continue to thrive and prosper. Ultimately, while addressing the health and economic problems of NCDs may be costly, ignoring them would be even more so.

References

Bloom, D E, E Cafiero, E Jane-Llopis, S Abrahams-Gessel, l Bloom, S Fathima et al. (2011a), *The Global Economic Burden of Noncommunicable Diseases*, World Economic Forum.

Bloom, D E, E T Cafiero-Fonseca, M E McGovern, K Prettner, A Stanciole, J Weiss S Bakkila and L Rosenberg (2014), "The macroeconomic impact of non-communicable diseases in China and India: estimates, projections, and comparisons", *Journal of the Economics of Ageing* 4(C): 100–111.

Bloom, D E, S Chen, M Kuhn, M E McGovern, L Oxley and K Prettner (2019), "The economic burden of chronic diseases: estimates and projections for China, Japan, and South Korea", *Journal of the Economics of Ageing* (forthcoming).

Bloom, D E, D Chisholm, E Jane-Llopis, K Prettner, A Stein and A Feigl (2011b), *From burden to 'best buys': reducing the economic impact of non-communicable diseases in low- and middle-income countries*, World Economic Forum and World Health Organization.

Case A, A Fertig and C Paxson (2005), "The lasting impact of childhood health and circumstance", *Journal of Health Economics* 24(2): 365–389.

Chen, S, M Kuhn, K Prettner and D E Bloom (2018), "The macroeconomic burden of noncommunicable diseases in the United States: estimates and projections", *PLOS ONE* 13(11): e0206702.

Currie, J, M Stabile, P Manivong and L L Roos (2010), "Child health and young adult outcomes", *Journal of Human Resources* 45(3): 517–548.

Dubensky Jr, T W and S G Reed (2010), "Adjuvants for cancer vaccines", *Seminars in Immunology* 22(3): 155–161. Academic Press.

Gneitling, U and H P Schmitz (2016), "Comparing global alcohol and tobacco control efforts: network formation and evolution in international health governance", *Health Policy and Planning* 31(1): i98–i109.

Preston, S H, P Heuveline and M Guillot (2000), *Demography: measuring and modeling population processes*, Wiley-Blackwell.

Preston, S H and A Stokes (2012), "Sources of population aging in more and less developed countries", *Population and Development Review* 38(2): 221–236.

United Nations (2017), *World population prospects (2017 Revision)*.

World Bank (2018), "Gross savings (% of GDP)", World Bank Database.

World Health Organization (WHO) (2014), *Global status report on noncommunicable diseases* 2014.

World Health Organization (WHO) (2018), "Noncommunicable diseases. Key facts".

About the authors

David E. Bloom is Clarence James Gamble Professor of Economics and Demography at Harvard T.H. Chan School of Public Health and Director of Harvard's National Institute of Aging Demography Center. Bloom also serves on the Board of Directors of the Population Association of America and is a founding co-editor of the *Journal of the Economics of Ageing*. Bloom's current research focuses heavily on the interplay of health, demographics, and economic growth and development. Bloom is an elected Fellow of the American Academy of Arts and Sciences and an Andrew Carnegie Fellow of the Carnegie Corporation of New York.

Simiao Chen is the head of the research group for health and population economics (assistant professor) at Heidelberg Institute of Global Health, Heidelberg University in Germany. Her primary areas of research include health economics, population aging, health system, and health policy. The main focuses are on the interrelations between health status and economic growth, the impact of policies on health and economic development, and social determinants of health. Simiao was also a consultant for the World Bank and Pan American Health Organization. She received her doctorate from Harvard University in 2018.

Michael Kuhn is (co-leader) of the research group on population economics at Wittgenstein Centre (IIASA, VID/OEAW, WU) and Vienna Institute of Demography. His research interests lie at the intersection of health economics and population economics, spanning themes such as the organization of health care, life-cycle behavior with endogenous health, and the impact of health and health care on economic growth and development. He has obtained a doctorate in economics from the University of Rostock, Germany, in 2001 and has previously worked at the Centre of Health Economics, University of York, UK, and at the Max-Planck-Institute for Demographic Research / University of Rostock.

Klaus Prettner is Professor of Economics at the University of Hohenheim and speaker of the research network Inequality and Economic Policy Analysis (INEPA). His research is primarily concerned with the interrelations between economic growth and inequality, the economic consequences of automation, and the impact of demographic change on long-run economic growth in industrialised economies. Klaus studied economics and statistics at the University of Vienna and obtained his Ph.D. in Economics in 2009.

Acknowledgements

7 Macroeconomic effects of ageing and healthcare policy in the United States

Juan Carlos Conesa, Timothy J. Kehoe, Vegard M. Nygaard and Gajendran Raveendranathan
Stony Brook University; University of Minnesota; University of Houston; McMaster University

The United Nations projects that the US old age dependency ratio (that is, the ratio of 65+ year-olds to 20- to 64-year-olds) will increase from 25% to more than 50% over the course of the 21st century because of decreasing fertility rates and increasing longevity. Attanasio et al. (2010) argue that the government will have to increase the labour tax rate by 12.7 percentage points by 2080 to finance the increase in Medicare, Medicaid, and Social Security spending.

In Conesa et al. (2019), we extend the analysis by Attanasio et al. (2010) and argue that, if the current increasing trend in college attainment persists throughout the 21st century, then only small increases in taxes will be required in the future because college graduates have higher labour productivity. An important assumption in our analysis is that healthcare costs will only increase as rapidly as per capita GDP. To the extent that healthcare costs will continue to increase more rapidly than per capita GDP, we need to explore fiscal measures to balance the budget. We explore the implications of eliminating Medicare and of eliminating both Medicare and Medicaid.

Implications of increasing college attainment, decreasing fertility, and increasing longevity

We develop a computer model of the US economy to analyse the fiscal implications of exogenous trends in college attainment, fertility, and longevity, and to analyse the fiscal and welfare implications of health insurance reforms (see also Conesa et al. 2018). In both models, we study the behaviour of individuals between the age of 20 and the time of their death, with a maximum life span of 100 years.

The model is a general equilibrium model because it analyses the economic interactions of firms and the government with individuals of all possible ages, alive in every period.[1] The fact that the model analyses the interaction of individuals of different ages means that it is an overlapping generations model. In every period, individuals face uncertainty over their labour productivity and their health status. An individual's health status affects her mortality risk, labour productivity, and need for healthcare. Healthcare expenditures are partially insurable through Medicare, Medicaid, and private and employer-provided health insurance. The government finances its expenditures on public healthcare programmes and Social Security by collecting taxes on consumption, capital income, and labour income.

We compute balanced growth paths for an economy to match features of the US economy in 2005 – including college attainment, fertility, and longevity – and an economy with the same features except for the projected changes in college attainment, fertility, and longevity in 2100.[2] The left-hand panel of Figure 1 shows that all three channels contribute to a higher old age dependency ratio. The horizontal axes in Figure 1 refer to the fraction of the 2100 projection for college attainment, fertility, and longevity, with intermediate values referring to linear combinations of the 2005 and 2100 values. Higher college attainment leads to a higher old age dependency ratio because college graduates have higher life expectancy than non-college graduates. Lower fertility leads to a higher old age dependency ratio because it leads to relatively fewer young individuals. Higher longevity leads to a higher old age dependency ratio because it leads to relatively more old individuals.

Figure 1   Old age dependency ratio (left panel) and labour tax rate (right panel)
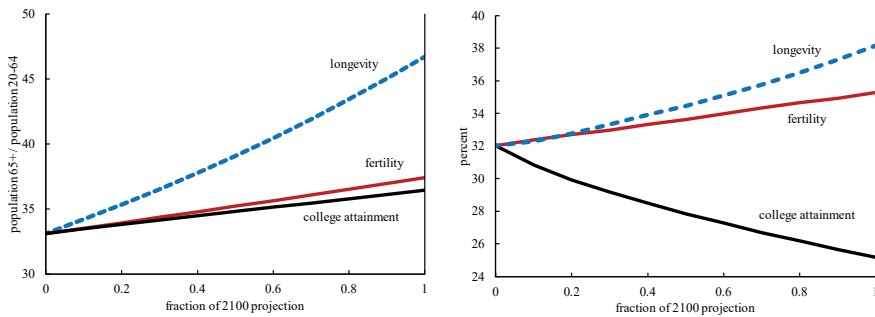
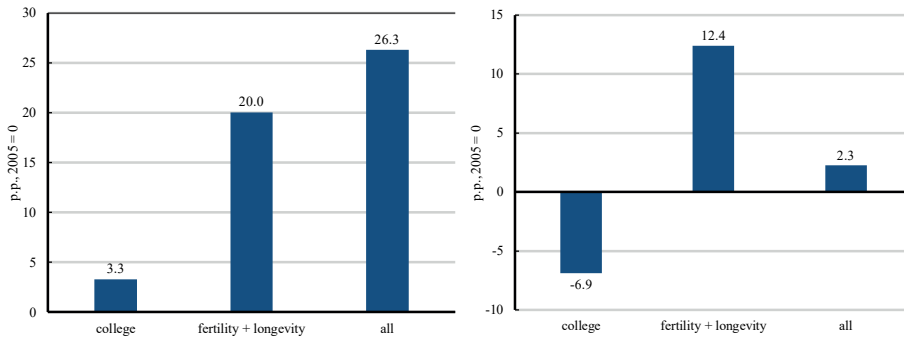*Source:* Conesa et al. (2019).

1   In Conesa et al. (2018), a period is one year, and in Conesa et al. (2019), a period is five years.
2   We use projections for fertility and longevity from the United Nations. We forecast college attainment by first estimating a linear trend for the share of the 20+ population with a college degree between 1960 and 2010, and then extrapolate this trend to 2100.

Consistent with the results of Attanasio et al. (2010), we find that lower fertility and higher longevity require the government to increase labour taxes, as shown in the right-hand panel of Figure 1. Higher college attainment, on the other hand, allows the government to reduce the labour tax rate. This is because higher college attainment leads to more productive workers, lower government spending on Medicaid, higher revenues from capital income, consumption, and labour taxation, and lower interest payments on government debt.

Figure 2 shows that there are interaction effects between the three channels of ageing. In particular, the left-hand panel shows that higher college attainment amplifies the increase in the old age dependency ratio due to lower fertility and higher longevity. On its own, this finding would lead us to expect that the necessary change in the labour tax rate to balance the government budget with all three channels of ageing would be greater than the sum of the first two bars in the right panel, that is, 5.5 (12.4 - 6.9) percentage points. In fact, however, the interaction of increased college attainment with lower fertility and higher longevity goes in the opposite direction, and the necessary increase in the labour tax rate is 2.3 percentage points.

Figure 2   Old age dependency ratio (left panel) and change in labour tax rate (right panel)

Source: Conesa et al. (2019).

Our result that the labour tax rate needs to increase by 2.3 percentage points depends crucially on general equilibrium interactions in our model and the fact that we have modelled all the major taxes in the US economy. To identify the general equilibrium effects in our results, we compare them with the results of a model where both the wage rate and the interest rate are fixed. We can think of this specification of the US as that of a small open economy, where the interest rate is determined in the rest of the world. In this specification, we find that the labour tax rate only has to increase by 0.03 percentage points. The required increase in the labour tax in the general equilibrium model is higher than that in the small open economy model as a the result of the fall in the capital income tax revenues due to a lower interest rate.

Implications of eliminating Medicare and Medicaid

In Conesa et al. (2018), we first study the fiscal and welfare implications of eliminating Medicare.[3] We compute the transition between the balanced growth path of the economy with Medicare and the balanced growth path of the economy without Medicare. In this transition path, middle-aged and old individuals who expected to receive Medicare benefits when they are old are surprised by the elimination of the programme.

The elimination of Medicare allows the government to reduce the labour tax rate by 2.7 percentage points.[4] This reduction is limited by the fact that a large share of the elderly respond to the elimination of Medicare by substituting Medicaid for Medicare. Consequently, the government saves only 46 cents for every dollar cut on Medicare.

Figure 3   Percentage of people that gain from eliminating Medicare by age
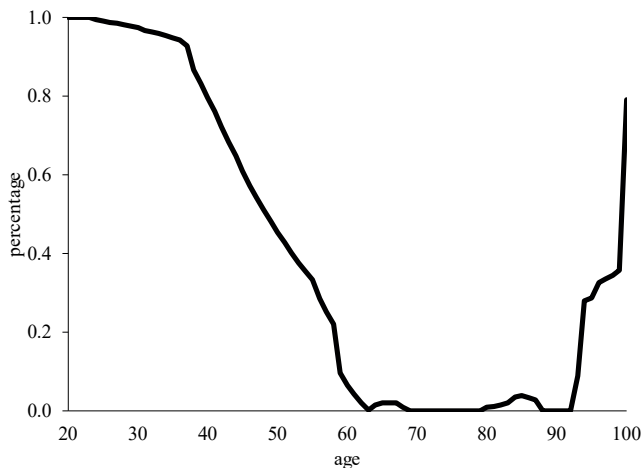
We then look at the welfare implications of the elimination of Medicare. In a balanced growth path of the model without Medicare, the labour tax rate is lower and the wage rate is higher. Future cohorts are therefore better off in a balanced growth path without Medicare. Similarly, we find that the majority of the current cohort gain from the elimination of Medicare because most of the current young individuals stand to benefit from this policy change. This finding is illustrated in Figure 3.

---

3   A crucial difference between Conesa et al. (2019) and Conesa et al. (2018) is that the 2018 paper focuses on the transition between balanced growth paths following policy changes.

4   We do not model the complete fiscal system in Conesa et al. (2018), as we do in Conesa et al. (2019). In particular, in the 2018 model, the government finances its expenditures solely through a proportional labor tax.

We quantify the welfare effects on those that benefit and those that lose from the elimination of Medicare by means of wealth equivalent variations (WEVs). That is, we compute the dollar value of how much wealth an individual must give up or receive in the balanced growth path of the economy with Medicare to make that individual indifferent between this economy and entering the transition to the balanced growth path of the economy without Medicare.

Table 1   Welfare effects of eliminating Medicare

Variable	Percentage that gain from eliminating Medicare	WEV (2010 US$)
Entire population	56.8	-9,900
Winners and losers		
Winners	100.0	3,600
Losers	0.0	-27,700
Educational attainment		
Non-college	56.2	-9,300
College	58.6	-12,100
Medical expenses		
Low	56.3	-10,300
High	57.5	-9,400
Catastrophic	61.8	-1,400
Wealth (quintile)		
1st	70.6	1,000
2nd	77.6	2,800
3rd	71.8	-1,800
4th	51.9	-10,700
5th	14.2	-39,600
Labour earnings (quintile)		
1st	40.1	-16,600
2nd	69.5	-4,500
3rd	70.2	-900
4th	68.8	-6,000
5th	36.0	-21,400

As illustrated in Table 1, we find that those who benefit from the elimination of Medicare experience an average welfare gain that is equivalent to a $3,600 increase in wealth. In contrast, those who lose out from the elimination of Medicare experience an

average welfare loss that is equivalent to a $27,700 reduction in wealth. Consequently, we find that the elimination of Medicare lowers aggregate welfare, and that the per capita welfare loss is equivalent to a $9,900 reduction in wealth in the economy with Medicare. Table 1 also breaks down the welfare effects for different educational groups, individuals with different current medical expenses, and individuals with different labour earnings and wealth.[5]

The government can achieve major savings by eliminating both Medicare and Medicaid. Eliminating both programmes allows the government to reduce the labour tax rate by 10.0 percentage points. This policy change, however, has large negative welfare implications. In particular, we find that only 19.4% of the current cohort benefits from the elimination of both Medicare and Medicaid, and that the per capita welfare loss of the policy change is equivalent to a $29,500 reduction in wealth in the economy with Medicare and Medicaid.

Discussion

A number of studies have shown that government spending on Medicare, Medicaid, and Social Security will increase over the next century because of decreasing fertility rates and increasing longevity. We have shown that the required increase in taxes needed to finance these programmes in the future depends crucially on the trend in college attainment. In particular, if the current trend in college attainment continues, then the government will only have to increase the labour tax rate by 2.3 percentage points by 2100 even if the current eligibility criteria and benefits levels for social insurance programmes are preserved. Note that this result is likely to be general in the sense that increasing college attainment is likely to mitigate the required increase in taxes brought about by decreasing fertility rates and increasing longevity in other countries as well. The extent to which increasing college attainment will mitigate the negative fiscal implications of the current demographic trends, however, will be country-specific and will depend on how fast college attainment is increasing in the country, how much more productive college-educated individuals are than non-college educated individuals, and how much longer college-educated individuals can expect to live.

Although increasing college attainment may offset most of the required increase in taxes due to decreasing fertility rates and increasing longevity in the US, it is unlikely to compensate for the negative fiscal implications of increasing healthcare costs.

---

5   In Table 1, the first earnings quintile, for example, refer to the 20 percent of individuals with the lowest current labor earnings.

Providing the current trend in healthcare costs continues, large increases in taxes will be required if Medicare and Medicaid are to be maintained. Alternatively, the government can change the eligibility criteria or the generosity of these programmes, but we have shown that such reforms will have large negative welfare implications for those individuals who are currently middle-aged and old. The government can reduce those welfare losses through redistribution. For example, it can lower the average welfare losses from the elimination of Medicare by redistributing resources from the current young to the current middle-aged and old individuals or by borrowing resources from future cohorts. We leave it for future research to examine how the US government can devise a transition path from the current system to a future system that both achieves major government savings and minimises the transitional welfare losses.

References

Attanasio, O, S Kitao and G L Violante (2010), "Financing Medicare: A general equilibrium analysis", in J B Shoven (ed.), *Demography and the Economy*, University of Chicago Press.

Conesa, J C, D Costa, P Kamali, T J Kehoe, V M Nygaard, G Raveendranathan and A Saxena (2018), "Macroeconomic effects of Medicare", *Journal of the Economics of Ageing* 11: 27–40.

Conesa, J C, T J Kehoe, V M Nygaard, and G Raveendranathan (2019), "Implications of increasing college attainment for aging in general equilibrium", Federal Reserve Bank of Minneapolis Staff Report 583.

About the authors

Juan Carlos Conesa is a Professor of Economics at Stony Brook University (SUNY), specialising on the macroeconomic implications of Public Finance. Since his PhD from the University of Minnesota in 1999, his research has focused mostly on social security systems and reforms, optimal tax progressivity and taxation in general, government debt crises, the interaction of trade and structural transformation, and, more related to this article, the implications of ageing and health care provision for macroeconomic performance.

Timothy J. Kehoe's research and teaching centre on the theory and application of general equilibrium models. In 2014, working with David Canning and David Bloom of the Harvard T. H. Chan School of Public Health and Juan Carlos Conesa of Stony Brook University, Tim received a five-year, four-million dollar grant from the National Institute on Aging of the National Institutes of Health.

Tim was named a Fellow of the Econometric Society in 1991; he was made Doctor Honoris Causa by the Universidade de Vigo in Spain in 2008 and by the Universitat de Barcelona in 2016; and he was made Socio de Honor of the Asociación Española de Economía in 2010. In 2011, he was named one of the inaugural Economic Theory Fellows of the Society for the Advancement of Economic Theory.

Vegard M. Nygaard is an Assistant Professor of Economics at the University of Houston. He received his B.A. in Economics from the University of Oslo in 2011, his M.A. in Economics from the University of Oslo in 2012, and his Ph.D. in Economics from the University of Minnesota in 2019. Vegard's research focuses on the macroeconomic effects of health inequality, health care policy, and ageing.

Gajendran Raveendranathan is an Assistant Professor of Economics at McMaster University. He received his B.Sc. in Economics in 2011 and his Ph.D. in Economics in 2017 at the University of Minnesota. His research focuses on the application of heterogeneous agent general equilibrium models to topics on macro health care, consumer credit, and firm dynamics.

8 Global demographic changes and international capital flows

Weifeng Liu and Warwick J. McKibbin[1]
Australian National University

The world has been experiencing dramatic changes in population growth and age structures since the second half of the 20th century (see, for example, Bloom and Luca 2016 for a review). These have been driven by decreasing fertility rates and increasing life expectancy (Figure 1). This unprecedented demographic transition has three distinct characteristics.

Figure 1

a) Total fertitlity rate

b) Life expectancy
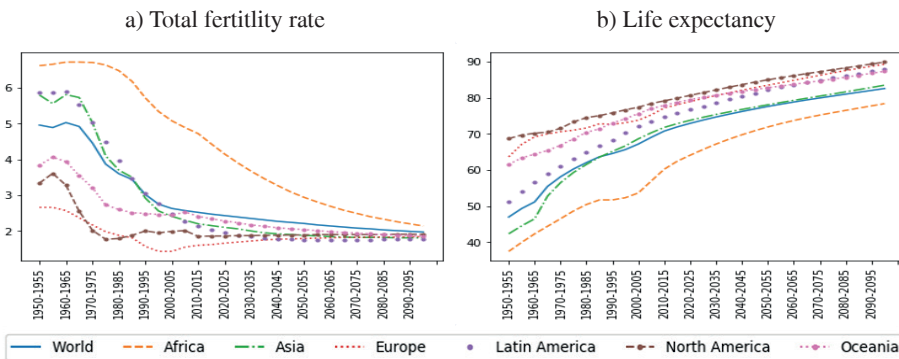
First, population growth has been slowing globally and is expected to decline further over this century (Figure 2a). The growth in the global total population was close to 2% in the 1950s and fell to around 1% in the 2010s. The rate is expected to further decline to around 0.5% by 2050. The growth of the global working-age population (aged 15-64) has also been decreasing since the 1980s, although it will continue to grow until 2050, mainly driven by the growth in Asia and Africa (Figure 2b).

Figure 2

a) Population growth rates b) Working age-age population (billions)
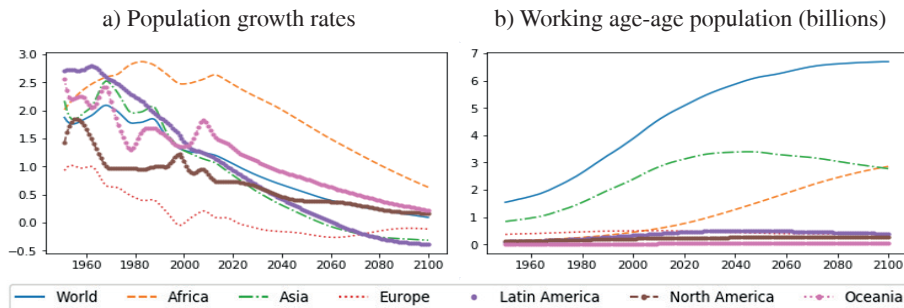
Second, population structures have been ageing in most regions and are expected to continue to do so in all regions in the next several decades. The youth dependency (the ratio of the population under 15 to the population aged 15-64) started to decline in the 1980s (Figure 3a), and the elderly dependency (the ratio of the population over 65 to the population aged 15-64) has increased rapidly since the 2010s (Figure 3b). The global population over 65 is projected to reach 0.7 billion by 2020 and 1.5 billion by 2050, representing 16% of the world's total population.

Figure 3

a) Youth dependency ratio b) Elderly dependency ratio
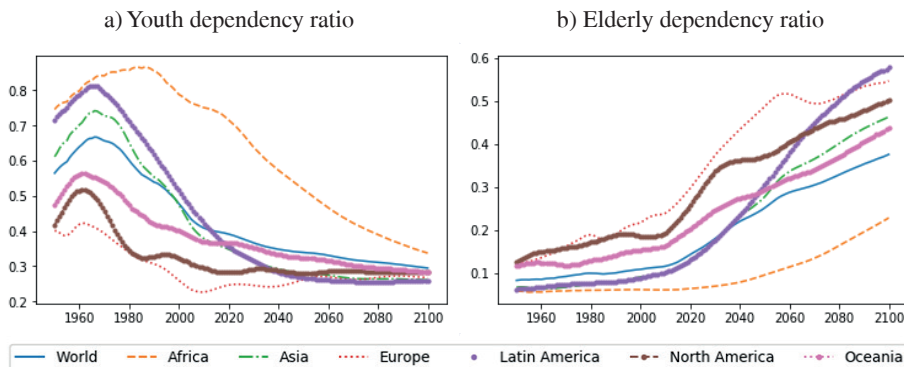
Third, regions and countries are significantly asymmetric in the timing and speed of this transition, particularly between developed and developing countries. European population growth has been much lower than the world average and the growth rate is already close to zero, with the working-age population declining since 2011. In contrast, Africa has grown strongly since 1950 and its growth rate is still as high as 2.5%. In the period from 2020 to 2050, more than half of global working-age population growth will come from Africa. Asia and Latin America have experienced similar declines in

population growth, and their working-age populations are both expected to increase until the 2040s before starting to decline.

All these characteristics are important for the overall macroeconomic impacts of demographic change, but the asymmetry is particularly important for the international aspects of demographic change.

Macroeconomic effects of demographic change

There is an enormous literature on the macroeconomic effects of population ageing in closed economies (e.g., Onofri 2004, Clark et al. 2007, Lee and Mason 2011, National Research Council 2012, Lee 2016). Here, we first consider the impact of demographic change on closed economies and then what it means for open economies.

On the consumption side, individuals tend to smooth their consumption over their lifetime by saving when they work and dissaving when they are retired (Modigliani and Brumberg 1954). Demographic change affects aggregate savings by altering the relative size of different age cohorts (young dependents, working adults, and elderly dependents) in the population. The current ageing process in developed countries is driven by the retirement of the baby boomers born in the first two decades after WWII, which were followed by sharp fertility declines. When this generation entered the labour force in the 1970s and 1980s and as fertility rates declined sharply, youth dependency ratios fell, so consumption on children also fell and savings rose. When this generation became prime workers in the 1990s and 2000s and as their life expectancy increased, they reduced their consumption and increased their savings in anticipation of a longer retirement period to smooth their consumption over their entire lives. When this generation gradually enters into retirement over the period 2010-2030, they should start to decumulate their assets, thus reducing savings. Developing countries have followed a similar ageing processes, but with considerable delays because they initially had much higher fertility rates, much shorter life expectancy, and much longer baby boom periods after WWII. However, their processes are expected to accelerate in the next several decades, so they should also experience such a process of first increasing savings and then decumulating savings.

On the production side, population ageing has significant impacts on economic growth through the labour supply channel. As fertility declines, labour force growth falls, so economic growth will also fall. Capital per worker rises, so output per worker and hence wages tend to rise, while the marginal product of capital falls and so does investment. This direct negative impact of labour scarcity on economic growth can be partly offset by the responses of households or governments to population ageing along several

dimensions (Bloom et al. 2001). For example, households are expected to work longer due to increasing longevity, and labour force participation may increase because more women can enter the labour force due to fertility declines and, more generally, women are encouraged to work in some countries where their participation has traditionally been culturally constrained. Capital per worker can increase as population ageing raises aggregate savings, and human capital can also increase as parents have more time and resources to invest in their children's education when family sizes shrink. Firms can also invest more in capital-intensive technologies to reduce the labour demand. All these responses have positive effects on economic growth, but they are unlikely to neutralise the negative effect of labour reduction.

The interaction of aggregate savings and investment drives the effect on the national real interest rate. The effect can be disentangled through two channels. First, when the baby boomers become prime workers and enjoy increasing longevity, they tend to increase their savings, which puts downward pressure on the real interest rate. Second, with decreasing fertility, the labour force falls because the following generations shrink, so capital per worker rises, which pushes down the real interest rate. Several recent studies find that demographic changes in advanced economies can explain significant fractions of real interest rate declines in the last few decades (Carvalho et al. 2016, Gagnon et al. 2016, Fujita and Fujiwara 2016, Lisack et al. 2017, Sudo et al. 2018).

Looking ahead, when the baby boomers in developed countries are retiring, their aggregate savings should fall and the declining trend of the real interest rate should be gradually reversed. However, as developing countries are accelerating towards ageing in the next several decades, their aggregate savings will tend to rise and thus put downward pressure on the world interest rate. The negative effect on the real interest rate could continue for a long time because the world as a whole will still be accelerating towards ageing.

Implications for international capital flows

The macroeconomic effects of population ageing in closed economies serve as a benchmark when we consider asymmetries across regions. In the context of an increasingly integrated world, the macroeconomic effects in open economies are more complicated when demographic changes are not synchronised and capital is mobile across countries.

International capital flows are fundamentally governed by arbitrage forces in the world capital markets. The real interest rate adjusted by country risk premiums and the expected change in the real exchange rate tends to be equal across countries unless

there are capital controls in some countries. If the real interest rate, adjusted by country risk premiums and the expected depreciation in the real exchange, is higher than the global interest rate, capital would flow in. Otherwise, capital will flow out.

While the decrease in the labour force in more rapidly ageing countries reduces the marginal product of capital and hence the real interest rate, the increase in the labour force in less rapidly ageing or still growing countries raises the marginal product of capital and also the real interest rate. This demographic asymmetry can stimulate capital flows from more rapidly ageing countries to less rapidly ageing countries to finance productive investment in the latter. The resulting current account surpluses and capital outflows can partially offset the reduction in rates of return on capital that would otherwise occur in rapidly ageing countries.

The cross-border effects of asymmetric demographic changes across countries can be both qualitatively and quantitatively important (e.g. Borsch-Supan et al. 2001, Brooks 2003, Fehr et al. 2003, Bryant 2004, Bryant and McKibbin 2004, Batini et al. 2006, Domeij and Floden 2006, Backus et al. 2014, Attanasio et al. 2016). The effects are becoming increasingly significant because global financial markets are becoming more integrated, not only within OECD countries but also between advanced and emerging economies. An increasing amount of research shows that capital flows from more rapidly ageing countries to less rapidly ageing countries are substantial, and suggests that studies on demographic changes in closed economies are likely to miss important effects of international capital mobility. Some studies show that considerable capital flows emerge between OECD countries as a result of asymmetric ageing processes, particularly between the US and Europe (and Japan), while others show that the demographic divergence between OECD countries as a whole and developing countries could stimulate capital flows from OECD countries to developing regions.

Capital flows across countries, particularly between developed and developing countries, are beneficial overall for both groups of economies. As capital per worker in developing countries is on average much lower than in developed countries, capital flows can accelerate capital deepening and boost economic growth in developing countries, while developed countries can enjoy higher rates of return on capital. Economic openness fosters a sharing mechanism to diversify demographic shocks with the rest of the world and mitigates the negative consequences of population ageing for domestic income and consumption, so financial globalisation plays a positive role in handling the international aspects of population ageing.

While developing countries can provide investment opportunities, they may not be able to absorb enough OECD savings to dramatically change the saving-investment balance for the OECD for two reasons. First, investment in developing countries requires

those countries to make major progress in macroeconomic management and financial stability. Second, developing countries are also experiencing ageing and their marginal product of capital will eventually decline, making their investment less attractive over time. Most early studies focused on the pattern of capital flows from developed to developing regions, but this pattern will start to reverse between 2010 and 2030, when the baby boomers in developed countries are retiring.

The magnitude of capital flows depends heavily on the openness and the relative size of countries. In a closed economy, national savings and domestic investment must move together. A small open economy has little impact on the global interest rate and its domestic investment moves more independently from domestic saving over the transition. The integration of global financial markets since the 1980s has facilitated capital flows across countries driven by asymmetric demographic changes. The magnitude also depends on the timing and relative speed of demographic change and how sensitive economies respond, on both the consumption and production sides, to demographic change.

Conclusion

Demographic change will continue to have important macroeconomic impacts on savings, investment, and real interest rates nationally and globally. Asymmetric demographic change will have important effects on the allocation of global capital and international trade balances, migration flows, and real exchange rates.

Demographic change is not taking place in isolation from other major global transformations. For example, technological change is an important engine of economic growth, and how technologies respond to population ageing in different countries will have important consequences that could reverse or accentuate the impact of ageing on the allocation of global capital and on the drivers of economic growth.

References

Attanasio, O, A Bonfatti, S Kitao and G Weber (2016), "Global Demographic Trends: Consumption, Saving, and International Capital Flows", in J Piggott and A Woodland (eds), *Handbook of the Economics of Population Aging*, pp 179–235.

Backus, D, T Cooley and E Henriksen (2014), "Demography and Low-Frequency Capital Flows", Journal of International Economics 92: S94–S102.

Batini, N, T Callen and W J McKibbin (2006), "The Global Impact of Demographic Change", International Monetary Fund Working Paper 06/9.

Bloom, D E, D Canning and J Sevilla (2001), "Economic Growth and the Demographic Transition", NBER Working Paper 8685.

Bloom, D E and D L Luca (2016), "The Global Demography of Aging: Facts, Explanations, Future", in J Piggott and A Woodland (eds), *Handbook of the Economics of Population Aging*, pp 3–56.

Borsch-Supan, A, A Ludwig and J Winter (2001), "Aging and International Capital Flows", NBER Working Paper 8553.

Brooks, R (2003), "Population Aging and Global Capital Flows in a Parallel Universe", *IMF Staff Papers* 50(2): 200–221.

Bryant, R C (2004), "Cross-Border Macroeconomic Implications of Demographic Change", Brookings Discussion Papers in International Economics No. 166.

Bryant, R C and W J McKibbin (2004), "Incorporating Demographic Change in Multi-Country Macroeconomic Models: Some Preliminary Results", in P Onofri (ed.), *The Economics of an Ageing Population*, pp 349–408.

Carvalho, C, A Ferrero and F Nechio (2016), "Demographics and Real Interest Rates: Inspecting the Mechanism", European Economic Review 88: 208–226.

Clark, R L, N Ogawa and A Mason (2007), *Population Aging, Intergenerational Transfers and the Macroeconomy*, Edward Elgar Publishing.

Domeij, D and M Floden (2006), "Population Aging and International Capital Flows", *International Economic Review* 47(3): 1013–1032.

Fehr, H, S Jokisch and L Kotlikoff (2003), "The Developed World's Demographic Transition - The Roles of Capital Flows, Immigration, and Policy", NBER Working Paper 10096.

Fujita, S and I Fujiwara (2016), "Declining Trends in the Real Interest Rate and Inflation: The Role of Aging", Working Papers 16-29, Federal Reserve Bank of Philadelphia.

Gagnon, E, B K Johannsen and D Lopez-Salido (2016), "Understanding the New Normal: The Role of Demographics", Finance and Economics Discussion Series 2016-080, Board of Governors of the Federal Reserve System.

Lee, R (2016), "Macroeconomics, Aging, and Growth", in J Piggott and A Woodland (eds), *Handbook of the Economics of Population Aging*, pp 59–118.

Lee, R D and A Mason (2011), *Population Aging and the Generational Economy: A Global Perspective*, Edward Elgar Publishing.

Lisack, N, R Sajedi and G Thwaites (2017), "Demographic Trends and the Real Interest Rate", Staff Working Paper No. 701, Bank of England.

Modigliani, F and R Brumberg (1954), "Utility Analysis and the Consumption Function: An Interpretation of Cross-Section Data", in K K Kurihara (ed.), *Post-Keynesian Economics*, Rutgers University Press, pp 388–436.

National Research Council (2012), *Aging and the Macroeconomy: Long-term Implications of an Older Population*, National Academies Press.

Onofri, P (2004), *The Economics of an Ageing Population: Macroeconomic Issues*, Edward Elgar.

Sudo, N and Y Takizuka (2018), "Population Aging and the Real Interest Rate in the Last and Next 50 Years – A Tale Told by an Overlapping Generations Model" Bank of Japan Working Paper Series No.18-E-1

About the authors

Weifeng Liu is a Research Fellow at the Crawford School of Public Policy at the Australian National University (ANU) and is also affiliated with the Australian Research Council Centre of Excellence in Population Aging Research (CEPAR). He holds a PhD degree in Economics from ANU. He has published on various topics in macroeconomics and public economics. His current research focuses on macroeconomic effects of demographic changes and dynamic general equilibrium modeling.

Warwick J. McKibbin is the Vice Chancellor's Chair in Public Policy and is Director of the Centre for Applied Macroeconomic Analysis (CAMA) in the Crawford School of Public Policy at the Australian National University (ANU). He is also a non-resident Senior Fellow at the Brookings Institution in Washington D.C. He was awarded the Order of Australia in 2016. Professor McKibbin is internationally renowned for his contributions to global economic modeling and the theory of monetary policy and has published more than 200 peer reviewed academic papers and 5 books as well as being a regular commentator in the popular press.

9 Ageing into risk aversion? Implications of population ageing for the willingness to take risks

Margaret A. McConnell and Uwe Sunde
Harvard T.H. Chan School of Public Health; University of Munich

Population ageing will affect virtually all countries in the world over the course of the next century, with far-reaching consequences for labour markets, social security, financial markets, goods markets, and macroeconomic performance in general. The social transformations that are associated with this ageing process will affect the lives of individuals around the world across many dimensions.

A striking feature of population ageing is the heterogeneity in ageing patterns across the world, which are likely to continue as improvements in health and life expectancy and changes in fertility patterns diverge. These differences are particularly pronounced among some of the largest countries of the world. Figure 1 displays the age distribution in India, China, and Nigeria in 2010 and contrasts this with the age distribution projected for 2050 (United Nations 2017). In 2010, the three countries exhibit markedly different age compositions, with India and Nigeria showing the typical pyramid-shaped age structure that has characterised most countries prior to the first demographic transition. In China, the age distribution shows a completely different shape as a consequence of the one-child policy that was implemented for the first time in 1979 and that subsequently led to a substantial reduction in cohort sizes.

In terms of the projected population, the three countries exhibit very different trajectories. In India, the age composition is projected to stabilise and transform into a distribution of approximately equal cohort sizes as a result of a reduction in fertility. In China, the low fertility rates are projected to prevail, which leads to an absolute decline in the sizes of young cohorts and the most dramatic consequences in terms of population ageing among the three countries. In Nigeria, on the other hand, the population is projected to continue to grow without any sign of a transition towards

lower population growth or population ageing. These dynamics will have important implications for macroeconomic performance by changing the age and education composition of the labour force (Kotschy and Sunde 2018).

One aspect that is often neglected in the context of population ageing is how ageing affects preferences and attitudes. In decision models, preferences are typically taken as primitives that affect the ways in which individuals make choices when facing tradeoffs. For instance, risk aversion determines individuals' willingness to choose between outcomes that are associated with different risk. Likewise, time preferences correspond to a measure of patience, in the sense of trading-off different outcomes over time, whereas social preferences reflect different concepts of other-regarding motives, such as altruism. Despite the important role they play in decision-making, the literature that tries to measure these preferences in the population is fairly recent. The development of simple, validated measurement tools to measure basic preferences, including risk, time, and social preferences, has shed light on the empirical distribution of preferences and has allowed for an increasingly sophisticated understanding of how preferences shape decision making in different domains. Examples include consistent findings that individuals who are more tolerant of risk are also more likely to engage in entrepreneurial activities, associations between patience and savings rates, and relationships between pro-sociality and charitable activities.

**Figure 1**   Population ageing in India, China and Nigeria
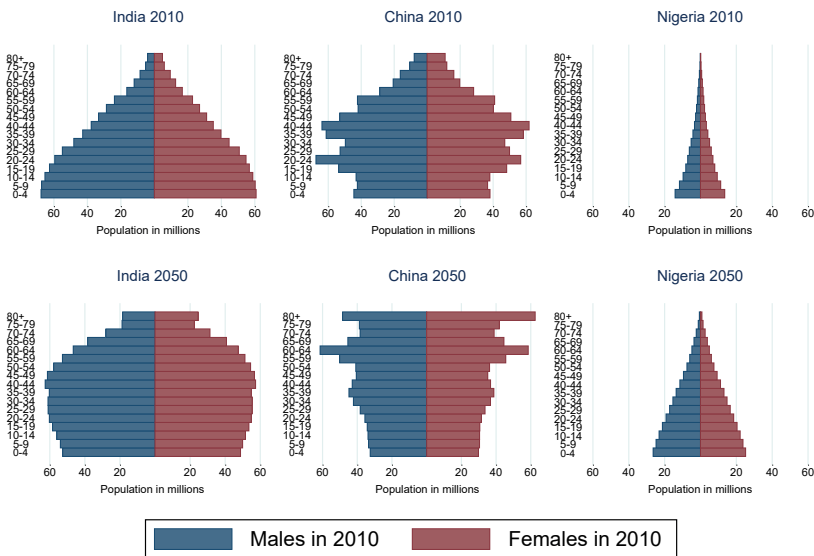
While generally recognised as important drivers of decision making, basic preferences are typically assumed to be static characteristics shaped by genetic factors, and cultural inculcation early in life. Until recently, not much was known about whether and how such preferences change over the life cycle. The reason was the lack of longitudinal data on preferences that could disentangle how preferences change as individuals age from differences in preferences across age groups that may stem from a variety of reasons, such as cohort effects that reflect differences in preferences across populations born into different environmental contexts. Recent evidence based on longitudinal data for individuals in Germany and the Netherlands demonstrated that the willingness to take risks systematically declines over the life course; this decline is approximately linear until age 65 and becomes flatter thereafter (Dohmen and Sunde 2016, Dohmen et al. 2017).

While there are no longitudinal data that would allow for a similar analysis outside of high-income countries, evidence of similar patterns emerges from cross-sectional data, as can be seen from Figure 2. The figure plots averages for individual willingness to take risks, measured in terms of standard deviations, for 20 equally-sized age groups for representative samples in India, China and Nigeria.[1] The emerging picture indicates differences in average willingness to take risks across countries, with Nigerian individuals exhibiting a relatively high tolerance of risk. Data for all three countries indicate that the willingness to take risks is lower for older age groups. Similar patterns have been documented globally (Falk et al. 2018). Although these trends could reflect cohort or period effects – for example, the effects of improvements in living conditions or changes in education and socialization – the relationships are nevertheless insightful. There is a pronounced decline in the willingness to take risks at older ages. This decline is strongest for individuals in China and weakest for individuals in Nigeria, with variation in the age gradient potentially reflecting in part the differences in the age structure displayed in Figure 1. The pattern of a negative relationship between the willingness to take risks and age is striking given that economic factors such as patterns of earnings over the life course and the underlying health conditions, such as exposure to health and environmental risks over the life course, are likely to be quite different across these settings. The collection of longitudinal data on preferences from low and middle-income countries would allow for a better understanding of the tendency for populations to become less willing to take risks over time and as they age.

---

1   Sample sizes range between 1,000 for Nigeria and 2,500 individuals for China and India; source: Global Preferences Survey (https://www.briq-institute.org/global-preferences/home).

Figure 2   Age patterns in risk attitudes in India, China and Nigeria
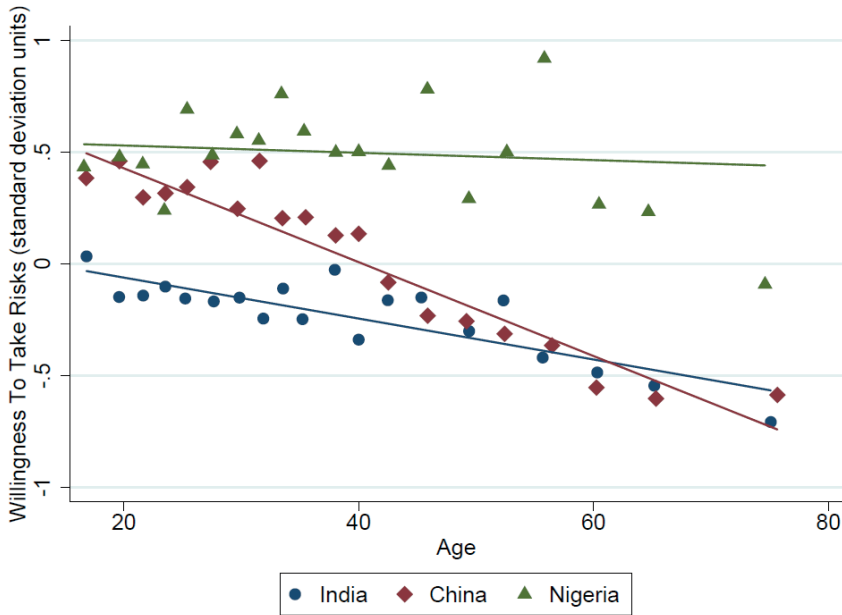
Considering the projected changes in the age composition of the three countries shown in Figure 1, a tendency to avoid risk with age would imply a growing overall tendency to avoid risk as result of an increasingly ageing population. This would have consequences for decisions across many domains, including labour market participation, savings and investment choices, and health behaviour. For example, an ageing population with increasing risk aversion may see lower levels of entrepreneurship and innovation. Likewise, a generally lower willingness to take risks would affect investment and insurance decisions at large, with a tendency to reduce returns on safe assets and an increase in risk premia for risky investments. Finally, increasing risk aversion at the population level could be expected to change the demand for health insurance and increase the demand for social insurance and institutions that protect against foreseeable or unforeseeable risks associated with the need for long-term care. A better understanding of the interdependencies between ageing, health, and behaviours related to changing preferences constitutes an important and fascinating challenge for future research.

References

Dohmen, T and U Sunde (2016), "Aging and Preferences", *Journal of the Economics of Aging* 7(1): 64-68.

Dohmen, T, A Falk, B H H Golsteyn, D Huffman, and U Sunde (2017), "Risk Attitudes Across the Life Course", *Economic Journal* 127: F95-F116.

Falk, A, A Becker, T Dohmen, B Enke, D Huffman and U Sunde (2018), "Global Evidence on Economic Preferences", *Quarterly Journal of Economics* 133(4): 1645-1692.

Kotschy, R and U Sunde (2018), "Can Education Compensate the Effect of Population Aging on Macroeconomic Performance?", *Economic Policy* 33(96): 587-634.

United Nations (2017), *World Population Prospects: 2017 Revision.*

About the authors

Margaret A. McConnell is an associate professor in the department of Global Health and Population at the Harvard T.H. Chan School of Public Health. She received a PhD in social sciences at the California Institute of Technology. She is a faculty affiliate of the Abdul Latif Jameel Poverty Action Lab. Her research applies tools from economics to answer questions about how to improve health outcomes for marginalized populations, with a particular focus on behavioral economic theory, experimental methods and impact evaluation strategies.

Uwe Sunde is Professor of Economics at the University of Munich (LMU), where he holds the chair of population economics. He studied economics at the Universities of Warwick, Universitat Pompeu Fabra, Barcelona and Munich and received a PhD in economics from the University of Bonn. Uwe Sunde is research professor at ifo, Munich and DIW, Berlin, and a fellow of the Center of Economic Policy Research (CEPR), London, and of the Institute of Labor Economics (IZA), Bonn. His research interests include population economics, growth and long-term development, labor economics, political economy, and behavioral economics.

10 Life cycle origins of pre-retirement financial status: Insights from birth cohort data

Mark McGovern
Rutgers University and Queen's University Belfast

One of the major concerns facing high-income countries which are experiencing rapid ageing is the extent to which the cohorts nearing retirement are financially prepared. 40% of the 8.5 million people currently aged 50-60 in the US are expected to be downwardly mobile in retirement, and overall 2.6 million of them are projected to have incomes lower than the poverty level, ($15,730 for a two-person household,) if they retire at age 62 (Ghilarducci et al. 2018). In the EU, 14.2% of pensioners were estimated to be in poverty in 2017.[1] Moreover, trends in financial wellbeing among this age cohort are not encouraging. In the UK, an additional 300,000 pensioners are now living in poverty compared to 2012/13 (Joseph Rowntree Foundation 2017). The long-running trend since 1994, which saw a sustained fall in poverty among this cohort in the UK, has been reversed. Structural factors such as the decline in home ownership (which raises housing costs), increased longevity, and/or accompanying morbidity have likely all played a role. Financial preparedness for retirement is also an issue. For instance, the proportion of older adults without savings and or a pension is concerning. The vast majority of Americans at age 62 will have very little income outside of social security when they retire (Ghilarducci et al. 2018).

While these figures refer to cohort averages, because both wealth and income inequality is high, a minority of households will nevertheless enjoy comfortable retirements. Two thirds of earning inequality carries over into pension inequality, even before accounting for the lower life expectancy of lower earners (OECD 2017a). These risks of adverse financial wellbeing are especially true in the UK compared to other high-income countries because of the financial costs associated with the lack of long-term care insurance, which are borne disproportionally by lower income groups (OECD 2017b).

---

1   https://ec.europa.eu/eurostat/web/products-eurostat-news/-/DDN-20190115-1

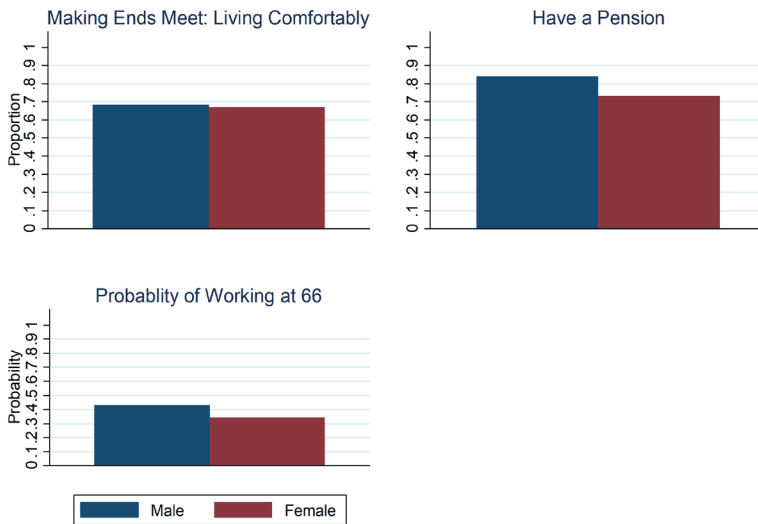## Life cycle determinants of financial wellbeing

Differences in the financial wellbeing of older adults can be examined according to current characteristics, such as income decile or place of residence. However, it is also possible to examine life cycle predictors. Broad categories such as education or current income may not provide a complete picture of how pre-retirement status has been shaped by early-life environment. We expect financial distress to be concentred among those who experienced multiple forms of adversity growing up (Hoven et al. 2017). Examining the specific early-life factors which predict financial wellbeing among older cohorts may help us identify the assistance that is needed for future cohorts to be better prepared for retirement. For example, if numerical ability in early life is an important predictor of having a pension pre-retirement, it may suggest that additional training in financial literacy during school may be valuable.

Financial wellbeing at age 55 in the UK

The series of British birth cohort studies, which began in 1946 and subsequently took place in 1958, 1970 and 2000, have provided extraordinary insights into many aspects of cohort members' lives (Pearson 2016). The importance of early-life factors for pre-retirement financial wellbeing is apparent from analysis of the 1958 cohort in the National Child Development Study (NCDS), a nationally representative sample of children born in England, Scotland, and Wales in the same week (Power and Elliott 2006). Interviews have been conducted periodically since, with the latest publicly available data collected in 2013 from around 8,000 cohort members at age 55. These data have been used to examine attitudes towards retirement and socioeconomic differences (Brown 2010, Carpenteri et al. 2017), but in this chapter I will expand this to include some of the other detailed information on early-life characteristics.

Figure 1 illustrates the share of this cohort who believe they will still be working at age 66 (the state pension age for this age group), the share who have a pension, and the share who live in a household where they are financially stable and are able to make ends meet. To examine sex disparities (e.g. Johnson et al. 1999), I show this analysis separately for men and women. Overall, almost 70% report that their household is making ends meet (living comfortably or doing alright, as opposed to just about getting by or finding it quite difficult or finding it very difficult) at age 55. There are sex differences in having a pension (over 80% of men compared to 70% of women) and in the estimated probability of working at age 66 (40% of men compared to 30% of women).

Figure 1   Financial wellbeing at age 55 in the UK

Source: 1958 National Child Development Study cohort

Life cycle origins of financial wellbeing at age 55

A major advantage of these data is that we can link these outcomes to life cycle determinants. Here I consider maths test scores at age 11 and a measure of self-control at age 7 (which was based on teacher reports of behaviour, such as whether they thought the child was impulsive). Each of these has been previously linked to adult economic outcomes (e.g. Daly et al. 2015, Currie and Thomas 2001). Other study designs do not afford the opportunity to consider contemporaneously collected data such as this.

Figures 2-4 illustrate that there are differences in later-life financial wellbeing according to these early-life factors. I present the average maths and self-control score by group (has a pension or not, feels the household is making ends meet or not, and the probability of working at age 66). The scores are coded so that a higher score represents greater self-control and maths score, and then normalised so that the coefficients can be interpreted in standard deviation units.[2]

---

2   See Daly et al. (2015) for further information on how the self-control data in the NCDS data are derived.

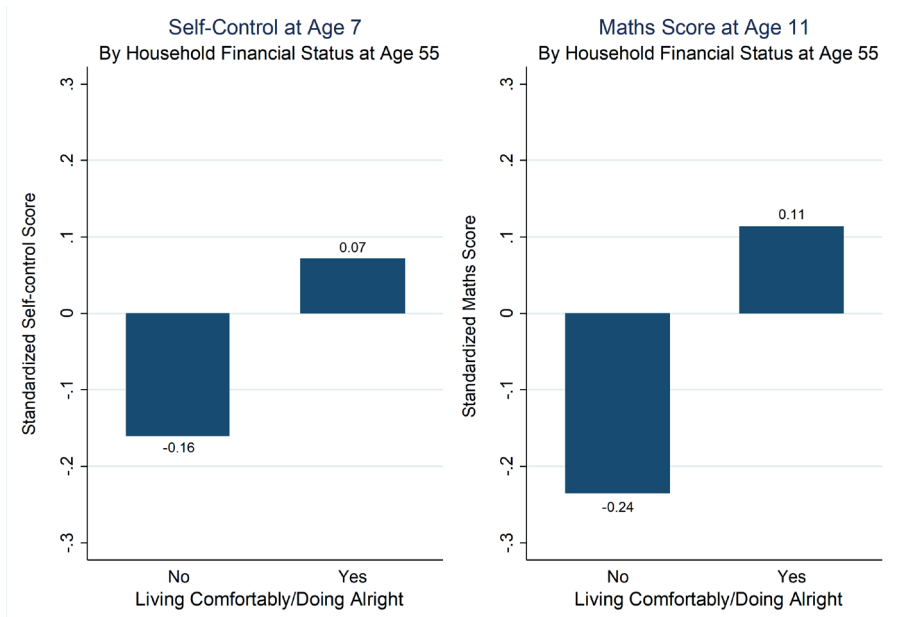**Figure 2**   Life cycle determinants and household financial status

Figure 3   Life cycle determinants and pension status
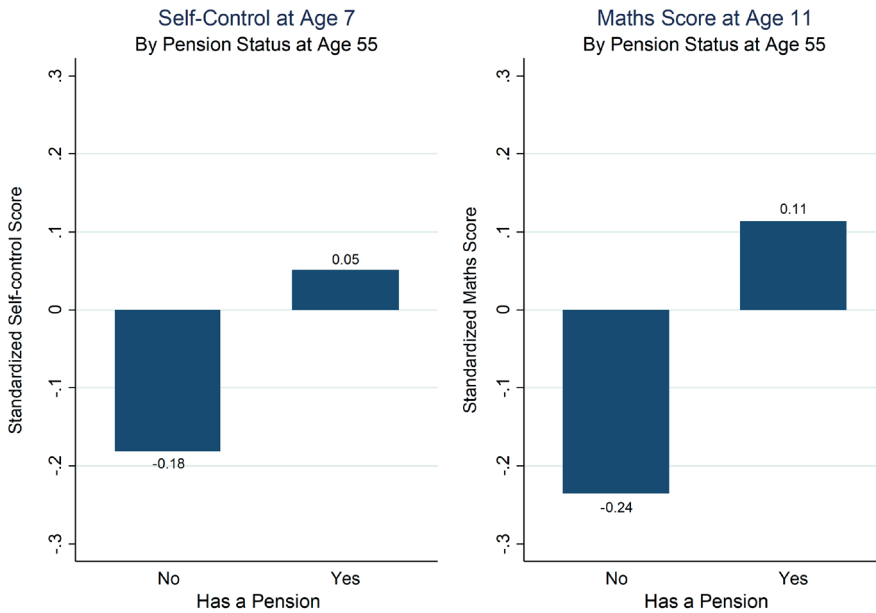
Figure 4   Life cycle determinants and the probability of working at age 66
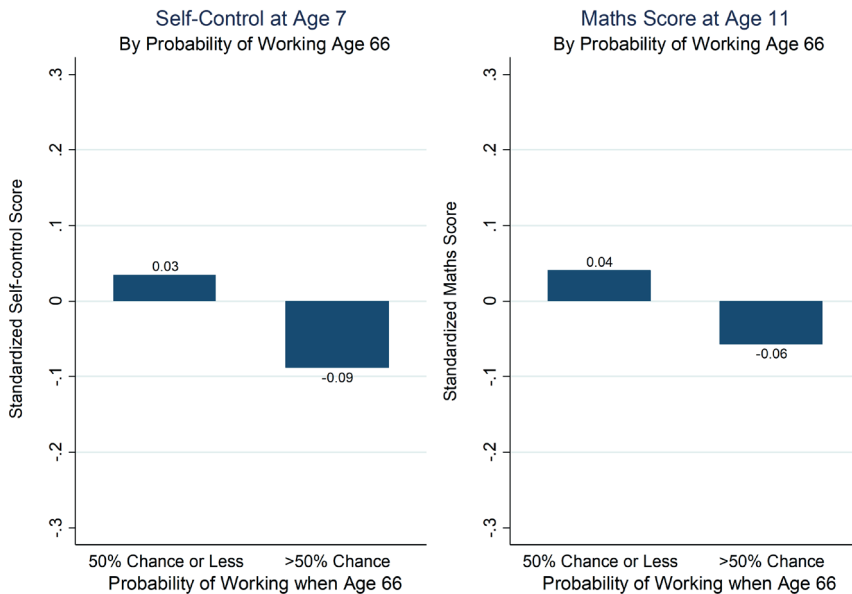
For each of these outcomes, we see differences according to the individual's early-life characteristics. For example, those who report that their household is able to make ends meet, have a pension, and believe they are less likely to be still working at age 66 all have higher maths scores at age 11 and self-control scores at age 7. The magnitudes here appear meaningful. For example, those who are doing well financially scored a third of a standard deviation higher on maths at age 11. Differences in early-life characteristics according to the likelihood of working at age 66 are still present, albeit smaller.

The analysis presented here is descriptive and only designed to illustrate that these early-life characteristics have predictive power for pre-retirement outcomes. There is a large literature which investigates whether these relationships are likely to be causal, and the mechanisms through which these life cycle influences may operate. Having said this, a statistically significant association between these predictors and these outcomes remains in regression models which adjust for other measures of early life circumstances, including maternal education, grandfather's social class, permanent family income, birth weight, and background demographic characteristics. Therefore, these factors identified above appear to be independent predictors of later-life financial status. An additional note of caution about the data is necessary: for all the strengths of cohort studies, attrition remains a concern and also needs to be considered carefully.

Conclusions

Differences in pre-retirement financial wellbeing are substantial, and in birth cohort data can be at least partly predicted from as early as ages 7 and 11. The main policy implication arising from these differences is that they strengthen the argument for taking the opportunity to invest now in the future of the current cohort of infants and children. Rates of return to early childhood development programmes have already been found to be high (Heckman et al. 2010), and incorporating additional benefits from post-retirement wellbeing would surely only make them more attractive. While assistance for older cohorts at risk of poverty is important, such assistance is likely to be less preferable than a well-funded pension derived from a consistent savings trajectory across the life cycle, which high quality early childhood development programmes would aim to facilitate. Finally, supported by the literature in behavioural economics, pension auto-enrolment schemes are being considered in many countries as part of national policies to prepare for changes in the population age structure. To the extent that these interventions are beneficial for overcoming biases in decision making, the finding that childhood self-control is an independent predictor of holding a pension in later life strengthens the argument in favour of these policies.

References

Brown, M (2010), "Attitudes towards Pensions and Retirement at Age 50: Initial Findings from the National Child Development Study", UCL Centre for Longitudinal Studies Working Paper.

Carpentieri, J D, A Goodman, S Parsons, P Patalay and J Swain (2017), *Lifetime poverty and attitudes to retirement among a cohort born in 1958*, Joseph Roundtree Foundation.

Currie, J and D Thomas (2001), "Early Test Scores, School Quality and SES: Longrun Effects on Wage and Employment Outcomes", in S Polachek (ed.), *Worker Wellbeing in a Changing Labor Market*, Emerald Group, pp. 103-132.

Daly, M, L Delaney, M Egan, and R F Baumeister (2015), "Childhood Self-Control and Unemployment Throughout the Life Span: Evidence From Two British Cohort Studies", *Psychological Science* 26(6): 709–723.

Ghilarducci, T, M Papadopoulos and A Webb (2018), "Downward Mobility in Retirement: 8.5 Million Middle-Class Workers Will Be Poor Retirees", The New School Schwartz Center for Economic Policy Analysis.

Heckman, J J, S H Moon, R Pinto, P A Savelyev, and A Yavitz (2010), "The Rate of Return to the HighScope Perry Preschool Program", Journal of Public Economics 94(1): 114–128.

Hoven, H, N Dragano, D Blane, and M Wahrendorf (2018), "Early Adversity and Late Life Employment History—A Sequence Analysis Based on SHARE", *Work, Aging and Retirement* 4(3): 238–50.

Johnson, R W, U Sambamoorthi and S Crystal (1999), "Gender Differences in Pension Wealth: Estimates Using Provider Data", *The Gerontologist* 39(3): 320–33.

Joseph Rowntree Foundation (2017), *UK Poverty 2017*.

OECD (2017a), *Preventing Ageing Unequally*, OECD Publishing.

OECD (2017b), "*Preventing Ageing Unequally: How does the United Kingdom Compare?*".

Pearson, H (2016), *The Life Project: The extraordinary story of our ordinary lives*, Penguin UK.

Power, C and J Elliott (2006), "*Cohort Profile: 1958 British Birth Cohort (National Child Development Study)*", *International Journal of Epidemiology* 35(1): 34–41.

Smith, J (2009), "Reconstructing Childhood Health Histories", *Demography* 46(2): 387–403.

About the author

Mark McGovern is an Assistant Professor at Rutgers University, and a health economist with research interests in maternal/child health, ageing, and HIV/AIDS. His main focus within these areas is on the life cycle impact of inequality at birth. His methodological work deals with missing data and causal inference, particularly the application of quasi-experimental approaches to address policy questions in population health related to health disparities.

11 A longevity dividend versus an ageing society

Andrew Scott

London Business School and CEPR

The facts are well known and have been for a while. Almost every country is seeing a rise in its average age and an increase in the share of its population aged over 60. The implications of this for GDP and public finances are a source of substantial concern (Lee 2016).

What is striking about this macroeconomic pessimism is that it is based on good news at the individual level – on average, in nearly every country, we are both living longer and are healthier for longer (Kassebaum et al. 2016, United Nations 2017). How can we reconcile the macroeconomic negativity of an ageing society with this more positive perspective that we are living longer, healthier, and potentially more productive lives?

Two channels

The explanation lies in the fact that there are two forces at work. The first is compositional. Due to falling birth rates and people living for longer, we are seeing a rise in the average age of the population. This is the standard ageing society channel. The second is more subtle and tends to be ignored – how we are ageing is changing. In particular, we are ageing more slowly in terms of mortality risk and overall health (e.g. Kingston et al. 2018, Levine and Crimmins 2018). Let's call this the longevity channel.

The problem is that most economic analysis of ageing focuses only on chronological measures of age (i.e. years from birth). Measured chronologically, everyone always ages at the same rate – one year every year. As a consequence, chronological measures of age abstract from any longevity effects, leaving a focus only on the more negative ageing society channel.

Is society really ageing?

Capturing improvements in how we age requires a biological measure. The challenge is a familiar one in economics – the distinction between real and nominal variables. The result is that chronological measures are vulnerable to what Shoven (2008) terms 'age inflation". Just as inflation makes $1 less valuable each year, so the malleability of age means one calendar year represents a smaller amount of biological ageing over time. This is the economic version of '60 is the new 50'.

Recent scientific research suggests it is possible to measure biological ageing through an epigenetic clock (Lu et al. 2019) but as this method is not yet widely available, other proxies tend to be used. The most common are mortality rates, which in effect measure expected time to death.

Once allowance is made for age inflation the evidence of an ageing society is much reduced, as are old age dependency ratios (e.g. Sanderson and Scherbov 2007). To see this, consider Figure 1, which shows average age and average mortality for Japan, the UK, and the US. All three countries have seen an increase in the average age of their population, but in the UK and US average mortality rates are lower at the end of the period than at the beginning.[1] In other words, the average Brit or American has never been older but has also never had so long left to live. It is far from clear that this can be unambiguously described as an 'ageing society'.

Figure 1   Average age and mortality rates

---
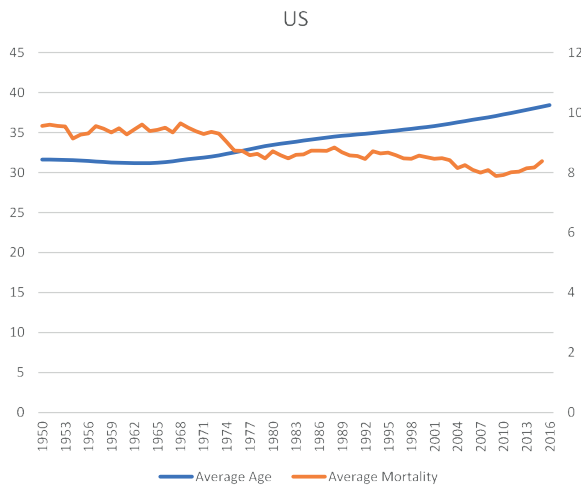
1   Although the rise in mortality remarked by Case and Deaton (2017) is obvious in the US data at the end of sample.

UK

Japan
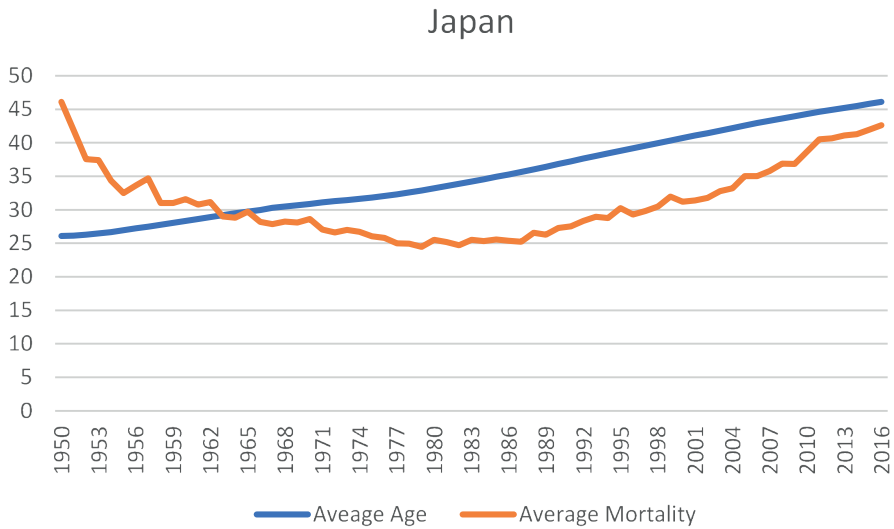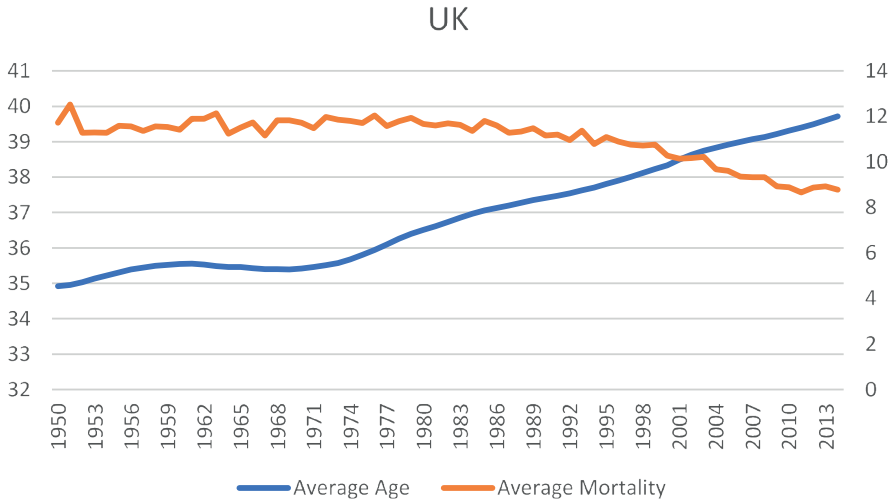
Source: Author's calculations from Human Mortality Database

Disentangling longevity and ageing

The ageing society channel focuses on changes in the age composition and predicts an increase in the average mortality rate. The longevity channel focuses on changes in how we age and points to falling average mortality rates. Using a Blinder-Oaxaca decomposition, Figure 2 shows the relative magnitude of the two effects for the US and Japan.

Figure 2   Ageing vs longevity effects for the US and Japan

a) USA
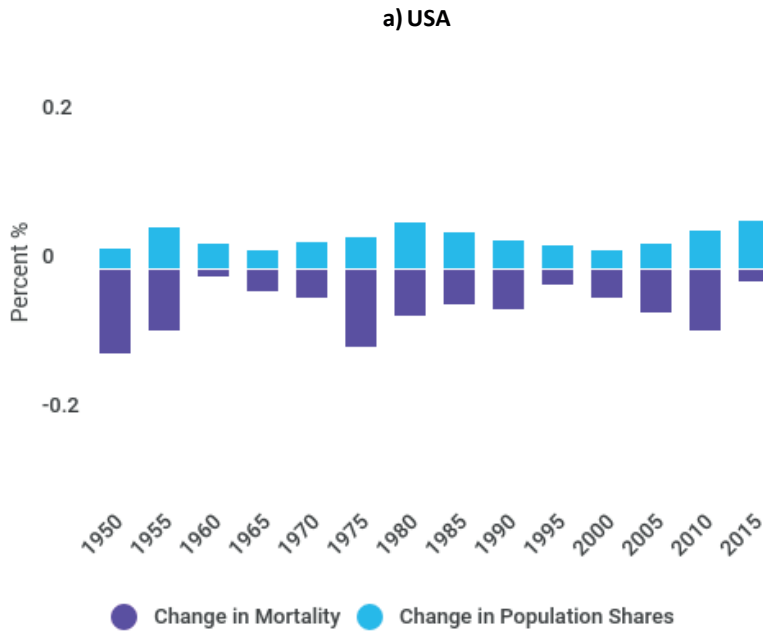
Japan has had a larger reduction in mortality rates than the US in absolute terms. However, the rapidity with which Japan went through its demographic transition means the ageing effect dominates. By contrast, the slower demographic transition in the US means the ageing channel is dominated by a longevity effect. The relative balance of ageing versus longevity channels varies in important ones across countries.

b) Japan
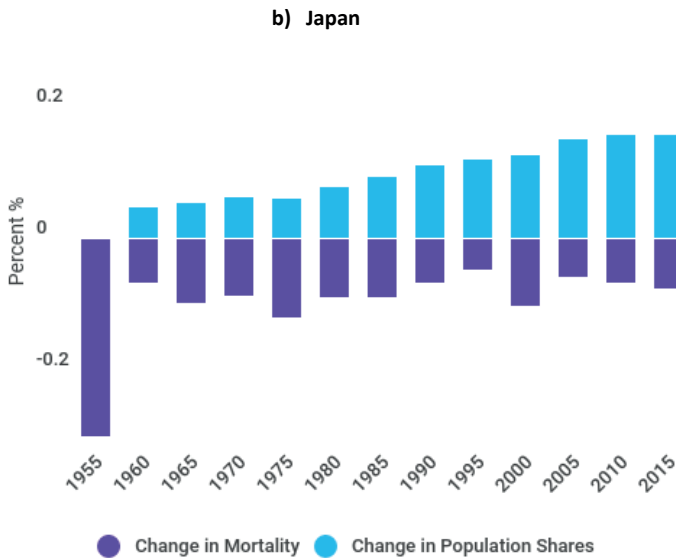
Source: Author's calculations using data from Human Mortality Database

Maximising the longevity channel

Maximising the economic dividend from longevity involves two dimensions: improving the drivers of age malleability, and ensuring improvements in healthy life expectancy feed through into the economy.

As the work of Marmot (2015) and Case and Deaton (2017) shows, age malleability isn't just about health care but is a product of many aspects of our behaviour and environment, including educational choices and working patterns. A growing scientific research programme is also seeking to understand the biological process of ageing (Blackburn and Epel 2018, Sinclair 2019), with some claiming that ageing is a disease amenable to a cure – the ultimate belief in the malleability of age. Given the rising importance of the longevity channel, investments in and government support for this research are likely to increase further.

Ensuring improvements in how we age feed through into economics benefits requires two sets of policies. The first involve removing barriers to a longevity dividend caused by policies based on chronological age. The second are the policies required to exploit and support longer working lives.

An obvious example of the former are policies around retirement. If retirement age is specified chronologically, then as people age better biologically, they will be prevented from working. Retirement ages need to shift to avoid 'age stickiness' blocking a longevity dividend.

However, achieving the full economic benefits of longevity involves more than just allowing for age inflation. For instance, if working careers extend, then human capital will depreciate, requiring further investment in order to maintain productivity. As a consequence, if retirement is increased from 65 to 70 but no new adult education measures are introduced, then a full longevity dividend will not be realised.

Identifying policy measures to fully exploit the longevity gains that longer lives enable should be at the heart of government's approach to dealing with longer lives. In 2018 the Japanese government attempted to do just that by setting up a Council for Designing 100 Year Life Society. Whilst the Japanese government is to be commended for this step, policies to support longer lives are best put in place when the population is young. If fast-growing emerging markets want to prepare themselves for an ageing society, they need to help the current young to age better.

The 100-year life

In 2016 my book, *The 100 year Life – Living and Working in an Age of Longevity*, was published (jointly written with my colleague Lynda Gratton). The book became a global bestseller, translated into 15 languages including a Japanese manga edition.

The premise of the book was the fact that on average we are living longer and more healthily than our parents and grandparents. Fundamentally, this is about having more time and in response we need to restructure the life course. This has major implications for careers, education, and financial planning. In other words, longevity is about all of life whereas the ageing society narratives tend to focus on end of life.

The 20th century saw the creation of a three-stage life of education, work, and retirement and with that came the invention of teenagers and retirees. This three-stage life course is deeply embedded in economics and in policy. It is the framework that underpins concepts such as the old age dependency ratio and the textbook version of Modigliani and Brumberg's Life Cycle Hypothesis.

As life elongates, however, this three-stage structure appears unsustainable. According to the UK government, a child born today has a one in three chance of living to a 100. Under plausible assumptions (Gratton and Scott 2016), that implies they will be working until their late 70s or even early 80s. It is hard to imagine what initial human capital can support a 60-year career. Technology will also prove a disruptor.

In *The 100 Year Life*, we made the argument that in response to longer lives a three-stage model of life would be transformed into a multi-stage one, made up of different career stages with breaks in between for rest, recuperation, as well as investments in human capital. Just as the 20th century saw the creation of new stages of life, so we are witnessing the same today.

This fundamental restructuring of the life course requires major policy changes. However, most government policies in response to ageing are aimed at simply adjusting the parameters of a three-stage life – for instance, raise the retirement age, lower the pension and increase contributions. Dealing with longevity will require far more deep-seated adjustments.

Education needs to shift from being front loaded to become a lifetime affair. Policies, such as those in Singapore which give individuals lifetime credits to use towards education, need to be introduced to ensure that everyone has access to relearning opportunities. Firms will have to shift towards recruitment cycles at all ages and provide on/off flexible working practices. Career breaks will be necessary to enable investment in human capital but also in health and relationships. An increasing number of firms are offering this as an option, but governments will also need to think about extending maternity and paternity leave to cover not just caring but also career breaks.

The ageing society narrative tends to assume that all the extra years of life have come at the end of life. In reality, they have really come in later middle-age. The challenge for individuals is how to use this extra time most effectively over the life course. For policymakers, educational institutions, and corporates, it is how to rewire existing institutions to deal with the shifting relationship between biological and chronological age and the restructuring of life that is involved.

Conclusion

It is undeniable that the world is experiencing an increase in the average age of its population. Focusing only on an ageing society runs the risk of failing to recognise that (1) demography isn't destiny – as well as seeing a change in the age structure of society, how we are ageing is changing; (2) what really matters to us as individuals and for the economy is not chronological but biological age; (3) there is much governments can do to positively influence how we age and support longer periods of productivity; (4) because age is malleable, dealing with considerable diversity across individuals will be a major challenge for policy; and (5) ultimately, this is about policies aimed at the life course and not just end of life.

The more that governments can exploit the benefits of the longevity channel, the more chance they have of translating the good news of longer healthier and more productive individual lives into positive news for the macroeconomy.

References

Blackburn, E and E Epel (2018), *The Telomere Effect: A Revolutionary Approach to Living Younger, Healthier*, Longer Grand Central Publishing.

Case, A and A Deaton (2017) "Mortality and Morbidity in the 21st Century", *Brookings Papers on Economic Activity*, Spring.

Gratton, L and A Scott (2016), *The 100 Year Life – Living and Working in an Age of Longevity*, Bloomsbury.

Kassebaum, N J et al. (2016) "Global, regional and national disability adjusted life years for 315 diseases and injuries and healthy life expectancy, 1990-2015: A systematic analysis for the Global Burden of Disease Study 2015", *The Lancet* 388(10053): P1603-1658.

Kingston, A, A Comas-Herrera and C Jagger (2018), "Forecasting the care needs of the older population in England over the next 20 years : Estimates from the Population Ageing and Care Simulation (PACSim) modelling study", *The Lancet* 3(9): PE447-E455.

Lee, R (2016),"Macroeconomics, Aging and Growth", in J Piggot and A Woodland (eds), *Handbook of the Economics of Population Aging*, Elsevier, pp. 59–118.

Levine, M E and E M Crimmins (2018), "Is 60 the new 50? Examining Changes in Biological Age Over the Past Two Decades", *Demography* 55(2): 387-402.

Lu et al. (2019), "DNA methylation GrimAge strongly predicts lifespan and healthspan" Aging 11(2):303-327.

Marmot, M (2015), *The Health Gap: The Challenge of an Unequal World* , Bloomsbury.

Sanderson, W and S Scherbov (2007), "A New Perspective on population aging", *Demographic Research* 16: 27-58.

Shoven, J (2008) "Adjusting Government Policies for Age Inflation", NBER Working Paper 14231.

Sinclair, D (2019), *Lifespan: The Revolutionary Science of Why We Age and Why We Don't Have To*, Atria Books (forthcoming).

United Nations (2017), *World Population Prospects: The 2017 Revision*.

About the author

Andrew Scott is Professor of Economics and a Fellow of the Centre for Economic Policy Research. He previously held positions at Oxford University, London School of Economics and Harvard University.

His research focuses on business cycles, fiscal policy and longevity. His book, with Lynda Gratton, *The Hundred Year Life* has been published in 15 languages and was runner up in the FT/McKinsey Business Book of the Year Award 2016 and Japanese Business Book of the Year Award 2017. Previously he was Managing Editor for the Royal Economic Society's *Economic Journal* and Non-Executive Director for the UK's Financial Services Authority and is currently on the advisory board of the UK's Office for Budget Responsibility.

Part II: Solutions and Policies: The 'Now What'

12 Understanding 'value for money' in healthy ageing

Karen Eggleston
Stanford University and NBER

The economics of population ageing is inseparable from the economics of healthcare. Increases in healthcare spending seem inexorable, absorbing a greater and greater share of economies around the globe. Successful social adaptation to older population age structures will therefore bring an increasing policy focus on the need for healthy ageing and understanding the value of our resources devoted to medical care.

Any discussion about health spending should be accompanied by discussion of the social value of that spending – as measured by quality-adjusted health spending or the net value of medical care, terms I will discuss below. This focus on 'value for money' should become as automatic in policy debates about health expenditures as currently any discussion of longer lives soon leads to a focus on healthy life expectancy or quality-adjusted life years, and most discussion of per capita living standards goes beyond GDP to consider fuller metrics of wellbeing.[1]

In short, policymakers should focus on measuring and improving the 'value for money' of medical care. Developing methods for assessing quality improvement and the net value of chronic disease spending is especially critical for ageing societies, because in most countries healthcare spending for chronic diseases represents a large and increasing part of public and private budgets.

Economic value of improvements in longevity and preventive care

Multiple economic studies confirm the high value of improvements in longevity. For example, Jones and Klenow (2016) estimate that a consumption-equivalent measure

---

[1] Fan et al. (2018) describe the many important metrics for development that have been proposed as alternatives, or supplements, to GDP per capita, and propose a new measure that incorporates healthy life expectancy and dispersion of income: Alternative wellbeing measure=(GDP per capita)×(healthy life expectancy)×(median income)/(mean income). Accurate measurement of GDP requires taking account of quality, and it is even more important for measuring the value of specific health investments, social preparedness for ageing (Chen et al. 2018), and sustainable financing of longer lives (Eggleston and Mukherjee 2019).

of economic welfare that takes account of life expectancy and leisure shows a 20-fold increase over a century compared to a seven-fold increase for per capita incomes alone. Murphy and Topel (2006) estimate that cumulative gains in life expectancy over the 20th century were worth over $1.2 million to the representative American. The Lancet Commission on Investing in Health's Global Health 2035 report (Jamison et al. 2013) estimated the economic returns of universal reduction in avoidable deaths from infections and maternal and child health conditions to be $9-20 for each dollar invested (see Table 1, Panel A).

Quantifying the value of medical spending, however, differs from measuring the economic value of longer lives for at least two reasons: non-medical factors contribute to increases in longevity, and medical spending yields gains in quality of life as well as longevity. Medical treatments may extend years of vitality, postponing the onset of disability and chronic diseases, so that morbidity will be compressed in old age (Fries 1983). This could have great economic value, especially if extending the years of vitality enabled more people to work longer before reaching their frail years (Eggleston and Fuchs 2012, Coile et al. 2016). One study found that healthy life increased measurably in the US between 1992 and 2008, with the largest improvements coming from control of cardiovascular disease and vision problems (Chernew et al. 2017). Research in many countries suggests that older people are generally healthier than in previous generations, and middle-income countries in particular could reap large economic benefits from control of major chronic diseases (Bloom et al. 2019).

Large economic benefits also often flow from prevention, including appropriate child and adult vaccination (Stack et al. 2011, Bloom 2015, Kaslow et al. 2018) and screening. Investments in appropriate screening and treatment can not only improve quality of life and extend lives, but may also reduce the rate of growth of medical expenditures. For example, many cancers found at an earlier stage have much greater chances of survival as well as much lower treatment costs per year of life gained compared to cancer not diagnosed until later stages. Universal access to appropriate screening would be desirable even if prevention extends lives without saving money, as is often the case.

However, barriers to such programmes are often numerous, especially in low- and middle-income countries (LMICs), including lack of awareness among the population about the value of screening and incentives to focus on curative treatments rather than preventive services. Residents virtually never rally in the streets for better population health services or measures that will save many 'statistical lives' (Viscusi and Aldy 2003); they do become inflamed when a specific individual is denied hospital admission or life-saving treatment. Thus, health resources tend to flow towards curative care rather than prevention. Moreover, designing an appropriate universal screening

programme requires incessant, evidence-based policy adjustment, since the science of cost-effective screening is complicated and evolving. Consider, for example, the case of thyroid cancer. Considerable evidence suggests that increases in screening in many parts of the world have led to over-diagnosis and unnecessary surgeries (Vaccarella et al. 2016, Du et al. 2018).

Determining which services and technologies are unnecessary and which are of high value can be complicated. As a first step, medical spending needs to be tracked appropriately. Government agencies and advisory boards have promoted better ways of aggregating healthcare spending (Atkinson 2005, National Research Council 2010, OECD, Eurostat, and WHO 2011). The US Bureau of Economic Analysis developed a healthcare satellite account to track spending on specific medical conditions and construct new disease-based price indexes (Dunn et al. 2015). This effort contributes to a better understanding of healthcare spending in ageing societies, confirming that the seemingly inexorable increase in spending stems primarily from increasing cost per individual treated, not from the greater number of patients treated. The next step is to incorporate a measure of the value of condition-specific spending. Are we obtaining value for the money devoted to treating given diseases?

The economic value of medical care's contribution to better health outcomes

Medical spending per individual with a given condition has generally increased. But outcomes from care are also better. The quality-adjusted cost of care may actually have declined, as Cutler et al. (1998) found in their pioneering research on AMI (heart attacks). Many other studies of medical conditions ranging from depression to cataracts have found similar results (Cutler and McClellan 2001, Shapiro et al. 2001, Berndt et al. 2002, Highfell and Bernstein 2014, Dunn et al. 2018, Wamble et al. 2018; see also Table 1, Panel B). Hult, Jaffe and Philipson (2018) find that new therapies mostly convey commensurate health benefits, with the innovation's quality-adjusted price higher than the incumbent therapy price for about two-thirds of innovations.

Hall (2017) provides a review of the literature on quality-adjusted price indexes for specific medical conditions. Dauda, Dunn and Hall (2019) compare alternative methods of quality adjustment, concluding that the utility-based "cost of living" method developed by Cutler et al. (1998) gives the "most theoretically accurate and robust results".

Determining the value of quality changes, such as improvements in survival, may seem a futile exercise in 'pricing the priceless'. But to reward value, we must first measure it.

Often, health economists will measure value by assuming each additional year of life brings a given monetary value, such as $100,000.

Because the health benefits of medical care are difficult to aggregate across disparate services and diseases, focusing on management of a single important chronic disease allows researchers to develop metrics of quality improvement and value that are linked to rigorous clinical studies (e.g. avoided hospitalisations from reduction in predicted risk of heart attacks and strokes for patients with diabetes).

Recently, an international collaboration of researchers, of which I was one, applied the cost-of-living quality adjustment method to one disease of growing prevalence in ageing societies – type 2 diabetes – drawing on and extending earlier work (see Table 1, Panel C). A previous study of a small (613-patient) US sample found a positive net value of diabetes management between 1997 and 2005 in the range of $1,050 to $2,215 for $100,000 per life-year gained, and an extension with 821 patients covering 1991-2009 found a similar result (Eggleston et al. 2009, 2011; see Table 1).

Interestingly, the four-system study found similar results with a much larger and more diverse sample. In Eggleston et al. (2019), my co-authors and I analyse a large dataset of patient-level panel data between 2006 to 2014, linking medical spending to biomarkers for 123,548 individuals with type 2 diabetes in four different health systems: one in Europe (the Netherlands) and three in East Asia (Japan, Hong Kong, and Taiwan). We measure the net value of medical care by applying the 'cost-of-living' approach (Cutler et al. 1998) that has some kinship with the 'value of life years' approach in environmental and development economics (e.g. Nordhaus 2002). Net value is the present discounted monetary value of any improved survival between the baseline and final periods, holding age and duration of diagnosis constant at their baseline values ('modifiable risk'), net of the increase in annual real modifiable spending per patient.

Results suggest that the value of improved survival outweighs the added costs of care on average in each health system. For example, in a study of Japan (Chen et al. 2018), my co-authors and I find a positive value net of $2,595 for $100,000 value of a life-year (Figure 1). To compare net value across the four health systems and different patient samples, we standardised by age and sex to the WHO world standard population. After standardisation, mean net value ranged between $600 and $10,000 for a $100,000 value of a life-year. The net values remain positive when assuming only half of survival gains were due to medical care, even though we very conservatively attributed all medical spending to diabetes. Our finding that the quality-adjusted 'cost of living' medical price index for managing diabetes has been declining across all four health systems is robust to various sensitivity analyses accounting for selective survival, end-of-life spending, and a range of values for a life-year or percentage of survival benefits attributable to medical spending.

Figure 1   Mean net value of improved modifiable mortality risk among individuals with diabetes in Japan
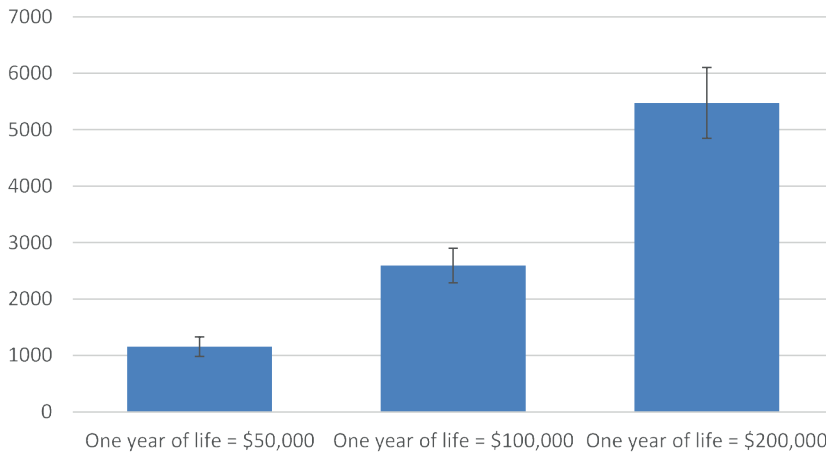
Source: Chen et al. (2018).

Figure 2   Net value by age group, relative to mean net value of individuals aged 60-64 in each health system (Japan, Netherlands, Hong Kong, Taiwan)
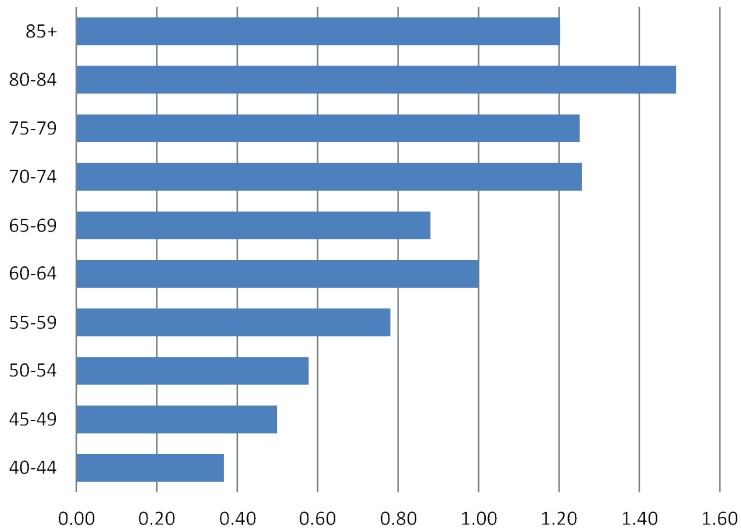
Source: Based on data from Eggleston et al. (2019).

Net value was positive for all age groups (Figure 2). Even among the relatively young prime-age workers living with diabetes (age 40 and 50) who have relatively small absolute risk of mortality, the monetary value of a small reduction in modifiable

mortality risk exceeded their increase in medical spending. Moreover, net value remains positive and significant for individuals well beyond traditional retirement ages. These results suggest the importance of continuing investments in treatments that deliver health outcomes of commensurate or higher value.

Most relevant for policy will be the ability to monitor and promote innovations that increase net value. For example, Skinner and Staiger (2015) document how small differences in the propensity to adopt effective technology lead to wide productivity differences across US hospitals. Other examples include comparing the net value of clinic- versus hospital-based care, and studying whether physicians who directly dispense medications to their patients improve patient adherence (Chen et al. 2018).

Taking account of quality change can lead to fundamentally different results on medical care productivity. For example, Romley et al. (2015) adjust for trends in the severity of patients' conditions and health outcomes when studying productivity growth among US hospitals in treating Medicare patients with heart attack, heart failure, and pneumonia during 2002–11. As in our study, they found that unadjusted productivity growth was negative (akin to a negative net value), whereas appropriate adjustment for quality changes suggested significantly positive rates of annual productivity growth (1.9%, 0.78%, and 0.62% for pneumonia, heart attack, and heart failure, respectively; see Table 1).

The fact that average quality-adjusted prices are declining does not obviate the need to address distorted payment incentives and market power that artificially inflate prices and their rate of growth, especially in health systems that foster competition and patient choice. Quality-adjusted price indices are complementary to, not a substitute for, research on policies such as antitrust enforcement, payment reform, the use of reference pricing, and incentivising cost-efficient referrals (Cooper et al. 2019).

Measuring the economic value of healthy ageing

In sum, confronting the challenges of ageing societies will require thinking carefully about the value of investments in new technologies for managing chronic conditions, and avoiding across-the-board cost control measures that stifle high-value care as much as low-value care. Focusing on other recent studies using US data, Dunn and Fernando (2019) discuss the challenges and importance of this line of research, emphasising that "these efforts are essential for understanding the trends in the medical care sector and our economy more broadly". More research on whether quality-adjusted price changes differ significantly across divergent health systems would be a valuable contribution to that effort.

Like addressing climate change, making high-value medical care affordable requires concerted policy efforts based on rigorous research. Cost control without measuring net value may foreclose or delay important breakthroughs. Healthy ageing to 100 and beyond will require being resiliently persistent in measuring the value of innovations for healthy ageing and rewarding those that deliver high net value. Financing equitable access to those innovations constitutes a profound challenge– but also an opportunity. Policymakers need not wait for global collective action to take steps now toward measuring and rewarding value.

Table 1   Research Studies Illustrating the Importance of Taking Account of Value When Studying Health Care Spending

Panel A: Illustrative studies of economic value of improvements in longevity

	Murphy and Topel (2006)	Jones and Klenow (2016)	Global Health 2035 report
	Murphy and Topel (2006)	Jones and Klenow (2016)	Global Health 2035 report
Setting	US	US	Global
Measurement	Present value of 20th century gains in life expectancy for a representative individual	Value of improvement in survival and greater leisure	Universal reduction in avoidable deaths from infections and maternal and child health conditions
Results	Economic value over $1.2 million	20-fold increase over a century (compared to only 7-fold increase in income per capita)	Economic value of $9-20 per dollar invested

Panel B: Selected Studies of Economic Value of Medical Care's Contribution to Better Health Outcomes

	Cutler et al. (1998)	Cutler and McClellan (2001)	Berndt et al. (2002)	Highfell and Bernstein (2014)	Romley, Goldman, and Sood (2015)
Setting	US	US	US	US	US
Medical condition(s)	AMI (heart attack)	AMI, low-birthweight infants, depression, cataracts, breast cancer	Depression	30 chronic diseases	AMI, heart failure, pneumonia
Results	Value of improved quality greater than spending increases: quality-adjusted prices declining	Value of improved quality greater than spending increases (except for breast cancer; benefits and costs of similar magnitude)	Incremental cost of successfully treating an episode of acute phase major depression has generally fallen	Net value of treatment is positive and has grown, leading to better health outcomes at a lower cost per patient	Positive rates of annual productivity growth of 1.9%, 0.78%, 0.62% when take account of value of quality changes

Panel C: Case Study: Diabetes

	Eggleston et al. (2009)	Eggleston et al. (2011)	Wamble et al. (2019)	Chen, Eggleston and Iizuka (2018)	Eggleston et al. (2019)
Setting	US (Mayo Clinic Rochester)	US (Mayo Clinic Rochester)	US (MEPS, GBD)	Japan (working ages)	Japan, Netherlands, Hong Kong, Taiwan
Years	1997-2005	1999-2009	1996-2015	2010-14	2006-14
Sample size	613	821	Aggregate data	7,432	123,548
Measure(s) of health outcomes: Did quality improve?	Improvement in fatal and non-fatal cardiovascular risks (from risk prediction model)	Improvement in fatal and non-fatal cardiovascular risks (from risk prediction model)	Improvement in health as measured in disability-adjusted life years	Improvement in all-cause mortality (from population-specific risk prediction model)	
Was net value positive? (assuming US$100,000 value of one year of healthy life) or other measure of value of medical spending	Positive net value: $1,050 (Outcomes model); $2,215 (UKPDS)	Positive net value ($9,094 for $200,000 value of a life-year)	$6,377 Incremental cost-effectiveness ratio ($560 increase in cost per person)	Positive net value: of $2,595 for $100,000 value of a life-year	Positive net value: between $600 and $10,000 for a $100,000 value of a life-year

References

Atkinson, T (2005), *Measurement of Government Output and Productivity for the National Accounts*, The Atkinson Review Final Report, Palgrave-Macmillan.

Berndt, E R, A Bir, S H Busch, R G Frank and S L T Normand (2002), "The medical treatment of depression, 1991–1996: productive inefficiency, expected outcome variations, and price indexes", *Journal of Health Economics* 21(3): 373-396.

Bloom, D E (2015), "Valuing vaccines: deficiencies and remedies", *Vaccine* 33: B29-B33.

Bloom, D E, S Chen, M Kuhn, M E McGovern, L Oxley and K Prettner (2019), "The economic burden of chronic diseases: estimates and projections for China, Japan, and South Korea", *The Journal of the Economics of Ageing,* 100163.

Chen, B, T Iizuka and K Eggleston (2018a), "Estimating the Social Value of NCD Control: Evidence from Japan", Stanford University Asia Health Policy Program working paper (earlier versions were presented at ECHE 2014 and iHEA 2017).

Chen, C, D P Goldman, J Zissimopoulos and J W Rowe (2018b), "Multidimensional comparison of countries' adaptation to societal aging", *Proceedings of the National Academy of Sciences* 115(37): 9169-9174.

Chernew, M, D M Cutler, K Ghosh, and M B Landrum (2017), "Understanding the Improvement in Disability-Free Life Expectancy in the US Elderly Population", in *Insights in the Economics of Aging*, University of Chicago Press and NBER.

Cooper, Z, S Craig, M Gaynor, N J Harish, H M Krumholz and J Van Reenen (2019), "Hospital Prices Grew Substantially Faster Than Physician Prices For Hospital-Based Care In 2007–14", *Health Affairs* 38(2): 184-189.

Coile, C, K Milligan, and D A Wise (2016), "Introduction to Social Security Programs and Retirement Around the World: The Capacity to Work at Older Ages," in *Social Security Programs and Retirement Around the World: The Capacity to Work at Older Ages*, University of Chicago Press, pp. 1-33.

Cutler, D M, M McClellan, J P Newhouse and D Remler (1998), "Are medical prices declining? Evidence from heart attack treatments", *The Quarterly Journal of Economics* 113(4): 991-1024.

Cutler, D M and M McClellan (2001), "Is technological change in medicine worth it?", *Health Affairs* 20(5): 11-29.

Du, L, Y Wang, X Sun, H Li, X Geng, M Ge and Y Zhu (2018), "Thyroid cancer: Trends in incidence, mortality and clinical-pathological patterns in Zhejiang Province, Southeast China", *BMC Cancer* 18(1).

Dunn, A and L Fernando (2019), "Medical Expenditures Are Likely "Worth It." But Can We Measure How Much They Are Worth?", *Health Affairs*, 20 February.

Dunn, A, L Rittmueller and B Whitmire (2015), "Introducing the New BEA Health Care Satellite Account", *Survey of Current Business* 95(1).

Eggleston, K N and V R Fuchs (2012), "The new demographic transition: most gains in life expectancy now realized late in life", *Journal of Economic Perspectives* 26(3): 137-56.

Eggleston, K N and A Mukherjee (eds) (2019), *Financing Longevity: The Economics of Pensions, Health and Long-term Care Insurance*, Special Issue of the *Journal of the Economics of Ageing*.

Eggleston, K N, N D Shah, S A Smith, A E Wagie, A R Williams, J H Grossman, JE R Berndt, K H Long, R Banerjee and J P Newhouse (2009), "The net value of health care for patients with type 2 diabetes, 1997 to 2005", *Annals of Internal Medicine* 151(6): 386-393.

Eggleston, K N, N D Shah, S A Smith, E R Berndt and J P Newhouse (2011), "Quality adjustment for health care spending on chronic disease: Evidence from diabetes treatment, 1999-2009", *American Economic Review Papers and Proceedings* 101(3): 206-11.

Eggleston, K N, B K Chen, Y I Chen, T Feenstra, T Iizuka, J T Lam, G M Leung, J-F R Lu, J P Newhouse, J Quan, B Rodriguez-Sanchez, and J Struijs (2019), "Are Quality-Adjusted Medical Prices Declining for Chronic Disease? Evidence from Four Health Systems", Stanford Asia Health Policy Program working paper.

Fan, V Y, D E Bloom, O Ogbuoji, K Prettner and G Yamey (2018), "Valuing health as development: going beyond gross domestic product", *British Medical Journal* 363: k4371.

Fries, J F (1983), "The compression of morbidity", *The Milbank Memorial Fund Quarterly. Health and Society* 61: 397-419.

Hall, A E (2017), "Adjusting the Measurement of the Output of the Medical Sector for Quality: A Review of the Literature", *Medical Care Research and Review* 74(6): 639-667.

Highfell, T and E Bernstein (2014), "Using Disability Adjusted Life Years to Value the Treatment of Thirty Chronic Conditions in the U.S. from 1987-2010".

Hult, K J, S Jaffe and T J Philipson (2018), "How Does Technological Change Affect Quality-Adjusted Prices in Health Care? Systematic Evidence from Thousands of Innovations", *American Journal of Health Economics* 4(4): 433-453.

Jamison, D T, L H Summers et al. (2013), "Global health 2035: a world converging within a generation", *The Lancet* 382: 1898-1955.

Jones, C I and P J Klenow (2016), "Beyond GDP? Welfare across countries and time", *American Economic Review* 106(9): 2426-57.

Kaslow, D C, S Black, D E Bloom, M Datla, D Salisbury and R Rappuoli (2018), "Vaccine candidates for poor nations are going to waste", *Nature* 564: 337-339.

Murphy, K M and R H Topel (2006), "The value of health and longevity", *Journal of Political Economy* 114(5): 871-904.

National Research Council (2010), *Accounting for Health and Health Care: Approaches to Measuring the Sources and Costs of Their Improvement*, National Academies Press.

Nordhaus, W D (2002), "The health of nations: the contribution of improved health to living standards", NBER Working Paper 8818.

OECD, Eurostat, and WHO (2011), *A System of Health Accounts,* OECD Publishing.

Romley, J A, D P Goldman and N Sood (2015), "US hospitals experienced substantial productivity growth during 2002–11", *Health Affairs* 34(3): 511-518.

Shapiro, I, M D Shapiro and D Wilcox (2001), "Measuring the value of cataract surgery", in *medical care Output and Productivity*, University of Chicago Press, pp. 411-438.

Stack, M L, S Ozawa, D M Bishai, A Mirelman, Y Tam, L Niessen, D G Walker and O S Levine (2011), "Estimated economic benefits during the 'decade of vaccines' include treatment savings, gains in labor productivity", *Health affairs* 30(6): 1021-1028.

Vaccarella, S, S Franceschi, F Bray, C P Wild, M Plummer and L Dal Maso (2016), "Worldwide thyroid-cancer epidemic? The increasing impact of overdiagnosis", *New England Journal of Medicine* 375(7): 614-617.

Viscusi, W K and J E Aldy (2003), "The value of a statistical life: a critical review of market estimates throughout the world", *Journal of Risk and Uncertainty* 27(5): 5-76.

About the author

Karen Eggleston is a Senior Fellow at the Freeman Spogli Institute for International Studies (FSI) at Stanford University, Deputy Director of the Shorenstein Asia-Pacific Research Center, Director of its Asia Health Policy Program, and a fellow with the National Bureau of Economic Research. With a PhD in public policy (Harvard University), her research focuses on health economics analysis of Asian health policy, especially in China, Japan, and Korea; public and private roles in the health sector; healthcare productivity; and the economics of population ageing.

13 Healthy population ageing depends on investment in early childhood learning and development

Elizabeth Geelhoed, Phoebe George, Kim Clark, Kenneth Strahan

CoLab, Telethon Kids Institute[1]

Population ageing presents policy challenges across the social and economic spectrum. Interventions in the early years provide a sustainable solution by generating long-term labour productivity and social welfare benefits. Prevention and mitigation strategies are commonly developed within national or even narrower perspectives, but coordinated global efforts are required to gather the best available research to inform evidence-based policies.

Major economic implications of the ageing demography are the costs of maintaining health and independence in an increasing elderly population and the increasing dependency ratio (United Nations 2015). Solutions – such as increasing the retirement age, changing pension eligibility, and increasing the employment rate of older workers – will alleviate the impact, but long-term sustainability requires a lifetime perspective.

Determinants of healthy longevity are multifactorial, but evidence indicates that many risk factors can be modified at every stage of life. The early years are increasingly recognised as a critical period for laying the foundations of healthy wellbeing and educational attainment in adulthood because of the brain's rapid development and the effects of positive and negative experiences on the brain's architecture during this time (Black et al. 2017). Early childhood is also a crucial phase for economic intervention because, while deleterious impacts can be mediated to some degree in adult life, the economic returns on investment diminish and net costs increase.

The highest return on investment is achieved for younger age groups and the more disadvantaged when comparing education and earnings (Cunha and Heckman 2007). Early childhood investment in health and education, with a strategic focus on inequality, has the potential to ameliorate consequences of population ageing, through strengthening the adult labour force and contributing to better health and independence in old age.

Disparate opportunities and challenges in early life lead to inequality in health and achievement gaps in later life. Disadvantage is not limited to financial deprivation but can also include lack of supportive environments and deficiencies in social and cognitive stimulation. Social and environmental stresses increase the risks of poor mental and physical health, substance abuse, and criminality in adulthood. The methodologically rigorous Carolina Abecedarian Project and the Perry Preschool Project trials (Conti and Heckman 2013, Karoly 2016) have shown clear benefits in terms of education attainment, crime reduction, and overall return on investment in disadvantaged populations over the longer term. Given the wide range of social, emotional, cognitive, and health developmental outcomes, interventions in early life have the potential to affect change that carries throughout the life course.

The evidence supporting causality between early childhood interventions and adult outcomes is substantial. The impact on ageing can occur even before the child is born (Allison et al. 2016). Influences are evidenced across physical and mental health, risk-taking behaviours, intergenerational mobility, and educational attainment (Belfield et al. 2006, Cunha and Heckman 2007, Doyle et al. 2009, Moore et al. 2015, Barnett and Frede 2017). Patterns established very early in life provide a blueprint for behaviours and events through childhood and adulthood. Adverse childhood experiences and stress have been linked with a range of chronic mental and physical health conditions and predetermine mental health problems in adulthood. They affect linguistic, cognitive, and socio-emotional skill development (Shonkoff et al. 2012) and increase anxiety, distress, hyperarousal, and depression. Stress exposure undermines social and coping reserves, self-esteem, social ties, and optimism. Socioeconomic disadvantage in childhood and frequent parental mistreatment is associated with fewer social resources and greater lifestyle risks in adulthood, particularly obesity and smoking. These contribute to additional health problems later in life and to reduced social integration and personal control (Ferraro et al. 2016). Interventions that address abuse, neglect, and early parent relationship difficulties can enhance circumstances and developmental outcomes with longstanding benefits (Cunha and Heckman 2007). Strengthening resilience in early childhood, assisting children's abilities to overcome adversity and disadvantage, supportive parenting or communities, and enhancing life satisfaction can improve outcomes in later life.

The long-term economic benefits of a healthy population and effective education attainment include reduced healthcare costs and a strengthened labour force. Public returns on investment are substantial. Positive benefit-cost ratios for early childhood interventions in health – particularly vaccination, family planning, and parenting programmes – have been consistently confirmed (Masters et al. 2017). Return on investment for immunisation in low- and middle-income countries was 16 times the cost for averted illness costs alone (Ozawa et al. 2011).

Positive benefit-cost ratios have been shown in studies of early education in the US and UK, accruing and increasing throughout life. Benefits derive from reduced costs of crime (criminal treatment and victim savings); reductions in child mistreatment, depression, tobacco use and substance abuse; and increased earnings. Fewer grade repetitions, less need for remedial education, projected crime reduction, and lower welfare use reduce costs over the life course, with returns of between $3 and $17 for each dollar invested (Karoly 2016). Investments provide additional trade-offs such as narrowing of the achievement gap, intergenerational advantages, and improvement in societal quality of life. A recent review compares the average return on stocks and bonds (2.4%) with that of education (10.5%). Consistent with previous studies, the highest returns are realised in low-income countries and otherwise disadvantaged groups (Psacharopoulos and Patrinos 2018).

The lifetime impact on healthy years gained through immunisation and newborn screening programmes is well established and widely recognised as standard clinical practice. Preventive health and education interventions during early childhood ought now to be similarly recognised. For example, long-term risks of physical inactivity emerge early in life, particularly for some disadvantaged groups (Cheval et al. 2018), and increase with age (Jones et al. 2013). Interventions that reduce physical inactivity in early childhood sustain long-term benefits due to causal effects related to obesity and diabetes, which contribute to the severe economic burden of an ageing population.

Most of the studies measuring labour and educational attainment outcomes are targeted to disadvantaged groups, where evidence suggests the socioeconomic disparity provides a greater gap for improvement and an opportunity to reduce inequality. The links between low socioeconomic status and poorer health and educational achievement are well documented. There is a strong economic case for increased investment in young children within vulnerable populations, since socioeconomic disadvantage is likely to be an exacerbating factor for risk across all domains throughout the life course. Thus, the degree to which policy choices adequately respond to the needs of these children in their early years is likely to play a major role in determining whether longevity is a blessing or a curse (Gratton and Scott 2016).

A universal approach provides benefits of early intervention for every child. This is consistent with the United Nations Convention on the Rights of the Child that supports all children's rights to best practice and reflects Marmot's characterisation of proportionate universalism (Marmot and Bell 2012). Targeted approaches can be nested within population-wide programmes to provide additional support where needed. Norway's highly acclaimed early education system, which is universally accessible, reflects this approach.

Early childhood interventions in health and education offer a critical underpinning of the broader raft of policy initiatives to successfully respond to the challenges of population ageing. Improving physical and mental health in early childhood will contribute to lifelong health and wellbeing and reduce the economic burden of an ageing population. Investments in enhanced learning, home environments, and parenting offer the potential to augment the cognitive skills and personal attributes that will improve adolescent and adult outcomes, especially for disadvantaged children, and keep them healthier and more productive longer.

Critically, returns on early childhood health and education investment are positive and often substantial, making them a long-term foundational strategy for healthier ageing.

Success of infection control and newborn screening programmes characterise lifetime advantages attributable to the 20th century. As we progress into the 21st century, there is an increasing need for a paradigm shift to encompass broader early childhood interventions to ensure a sustainable and optimal life course for all. Within a constrained economy, shifting resources from critical-needs response to prevention for the following generations is politically problematic, but provides long-term benefits including a more productive labour force and a more independent and healthy aged population.

References

Allison, B J et al. (2016), "Divergence of mechanistic pathways mediating cardiovascular aging and developmental programming of cardiovascular disease", *The FASEB Journal* 30(5): pp. 1968–1975.

Barnett, W S and E C Frede (2017), *Long-term effects of a system of high-quality universal preschool education in the United States*, Reardon, pp. 152–172.

Belfield, C R, M Nores, S Barnett and L Schweinhart (2006), "The High / Scope Perry Preschool Program : Cost-Benefit Analysis Using Data from the Age-40 Followup", *The Journal of Human Resources* 41(1): 162–190.

Black, M M et al. (2017), "Early childhood development coming of age: science through the life course", *The Lancet* 389(10064): 77–90.

Cheval, B. et al. (2018), "Effect of early-and adult-life socioeconomic circumstances on physical inactivity", *Medicine & Science in Sports & Exercise* 50(3): 476–485.

Conti, G and J J Heckman (2013), "The Developmental Approach to Child and Adult Health", *Pediatrics* 131(S2).

Cunha, F and J J Heckman (2007), "The Technology of Skill Formation", *American Economic Review* 97(2): 31–47.

Doyle, O, C P Harmon, J J Heckman and R E Tremblay (2009), "Investing in early human development: Timing and economic efficiency", *Economics and Human Biology* 7(1): 1–6.

Ferraro, K F, M H Schafer and L R Wilkinson (2016), "Childhood Disadvantage and Health Problems in Middle and Later Life : Early Imprints on Physical Health ?", American Sociological Review 81(1): 107-133.

Jones, R A,T Hinkley, A D Okley and J Salmon (2013), "Tracking Physical Activity and Sedentary Behavior A Systematic Review", *American Journal of Preventive Medicine* 44(6): pp. 651–658.

Karoly, L A (2016), "The economic returns to early childhood education", *The Future of Children* 26(2): pp. 37–55.

Marmot, M and R Bell (2012), "Fair society , healthy lives", *Public Health* 126: S4–S10.

Masters, R, E Anwar, B Collins, R Cookson and S Capewell (2017), "Return on investment of public health interventions : a systematic review", Journal of Epidemiology and Community Health 71(8): pp. 827–834.

Moore, T G, M McDonald, L Carlon and K O'Rourke (2015), "Early childhood development and the social determinants of health inequities", *Health Promotion International* 30: ii102-ii115.

Ozawa, B S, S Clark, A Portnoy, S Grewal, L Brenzel and D G Walker (2011), "Return On Investment From Childhood Immunization In Low- And Middle-Income Countries, 2011 – 20", *Health Affairs* 35(2): 199–207.

Psacharopoulos, G and H A Patrinos (2018), "Returns to investment in education : a decennial review of the global literature", *Education Economics* 26(5): pp. 1–14.

Shonkoff, J P, A S Garner et al. (2012), "The lifelong effects of early childhood adversity and toxic stress", *American Academy of Pediatrics* 129(1): e232–e246.

United Nations (2015), *World Population Ageing*.

About the authors

Dr Elizabeth Geelhoed is a Professor in Health Economics and Policy and has worked as a health economist over the past 25 years both within the academic environment (research and teaching) and within government departments (policy development). She currently leads the economics research within CoLab at The Telethon Kids Institute in Perth, where the research focus is on the costs and benefits of investment in early childhood. A current project will assess the relative benefit of investments cross-sectorally. Particular interests include methods of economic evaluation; equity; and the integration of economics with epidemiology and policy.

Phoebe George is a researcher with experience in children's health promotion research, who works at the Telethon Kids Institute in Perth, Western Australia. She has a Bachelor of Science (Neuroscience) and has recently completed the requirements for a Masters of Public Health at the University of Western Australia.

Dr Kim Clark has extensive experience in policy and management roles in public and community health, as an evaluator of maternal and child health programs and services, and as an educator-researcher in the tertiary sector. He is currently Co-Director, Research at the Western Australian Telethon Kids Institute's CoLab. There, he is undertaking an evaluation of an ambitious community trial focussing on reform and innovation in services in disadvantaged areas that support and complement the child rearing efforts of families. It is hoped this work will lead to new understandings about how the socio-economic divide in child development outcomes before school commencement can be remedied.

Dr Kenneth Strahan is a consultant economist and social researcher with 40 years' research and policy experience at all levels of government and industry. He has recently assisted in a systematic review of the return on early childhood investment. Currently he is developing emergency management policy responses to his research findings on human behaviour in wildfire. He has been published in *Environmental Hazards*, *International Journal of Disaster Risk Reduction,* and *Journal of Risk Research*.

14 Financing health services for the Indian elderly: Aayushman Bharat and beyond

Ajay Mahal and Sanjay K. Mohanty

The Nossal Institute for Global Health, University of Melbourne; International Institute for Population Sciences, Mumbai

In June 2018, the Indian Prime Minister Narendra Modi laid the foundation stone for a new National Centre for Ageing in New Delhi (Press Information Bureau 2018). It was symptomatic of the times. In 1950, only 5.3% of India's population was aged over 60 years. By 2015, almost 65 years later, the share of the elderly population had increased slowly to 8.9%. However, by 2050, only 30 years on, this share is expected to more than double to 19.1% according to UN estimates. At 316 million strong, the number of India's elderly in 2050 will be almost the same as the entire population of the US today.[1] A recent World Bank report estimates it will take another three decades of existing levels of growth for India to vault into the ranks of developed nations: in other words, India is likely to grow older before it grows richer (Ahmad et al. 2018). Successfully negotiating the socioeconomic needs of an ageing population in this context, and in a democratic polity, presents a substantive challenge that could well have major implications for India's economic and political ambitions in the 21st century.

Ageing and the epidemiological transition in India

Two factors have driven India's rapidly growing share of the elderly: a trend towards having fewer children and longer-lived adults, including at older ages. The number of children borne by an Indian woman during her reproductive lifetime has declined from nearly six on average in the 1960s to two in 2015. The number of years an Indian newborn could expect to live was 36 years in 1950, almost half of today; and a 60-year old Indian can expect to enjoy another 20 years of life today, almost double that in the 1960s.

---

1   Source: UN Population Prospects Database (https://population.un.org/wpp/).

Alongside a demographic shift towards older ages has come an epidemiological shift. While improved nutrition, public health interventions, childhood immunisation programmes, and health services have increased the lifespan of Indians, the rising numbers of elderly in India have been accompanied by a growing burden of chronic non-communicable diseases (NCDs) such cardiovascular disease, respiratory conditions, cancers, and diabetes (Figure 1). Part of the rising share of noncommunicable conditions in the disease burden can be attributed to the early onset of conditions such as heart disease and diabetes among working age Indians (Prabhakaran et al. 2016). Nonetheless, the much larger noncommunicable disease burden among older Indians and their rising share in the population suggests that NCDs will be a major and growing health policy challenge in future years.

Figure 1   Share in disease burden by cause and age group in India, 1990 and 2017
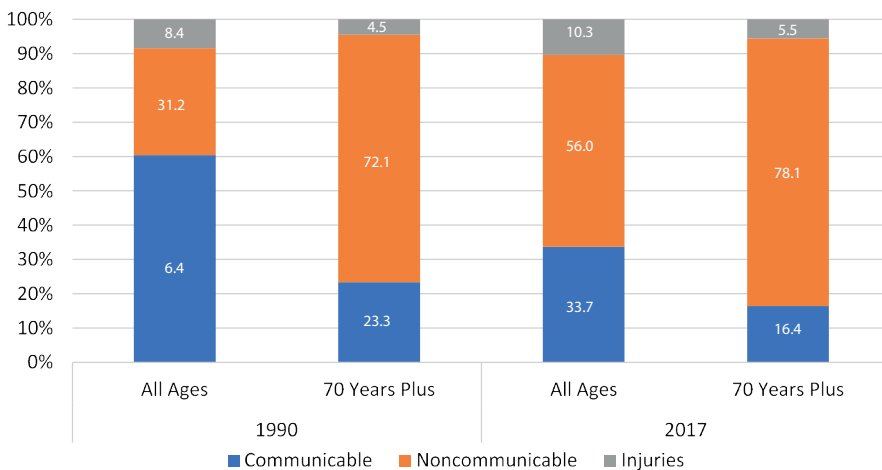
Source: Institute for Health Metrics and Evaluation.

Challenges posed by growing numbers of elderly

Unlike their middle- and high-income country counterparts, the lack of formal sector employment – more than 90% of India's workforce is in the informal sector (Mahal and Karan 2019) – implies that India's elderly are mostly unable to access the relatively generous retirement benefits available to formal sector retirees. Most elderly Indians live with their children, so the health and income requirements of older Indians are expected to be absorbed by their family members, at little or no cost to the government.

This understanding of the family as the main source of support has underpinned the limited central and state government schemes to benefit the poor, including various pension programmes that focus on paying out small stipends to the indigent elderly and laws intended to penalise people who do not take care of their elderly relatives (Cherian 2015, Pension Parishad 2018).

The Indian family as an elderly support mechanism is under growing stress, however, owing to a combination of fewer adult children, the elderly living longer and often with disability, migration for work, increasing healthcare expenses, and other financial costs of supporting elderly relatives. Consequently, there is a growing gap between elderly needs and the financial, healthcare and social support available to them (Cherian 2015). Healthcare spending is of special concern, being almost 2-5 times as high for individuals aged 60-years and older compared to younger adults (Figure 2). In a recent article, Pandey et al. (2018) show that health expenditures sharply increased the risk of impoverishment among households containing elderly members.

Figure 2   Private and public expenditure per capita by age, 2005
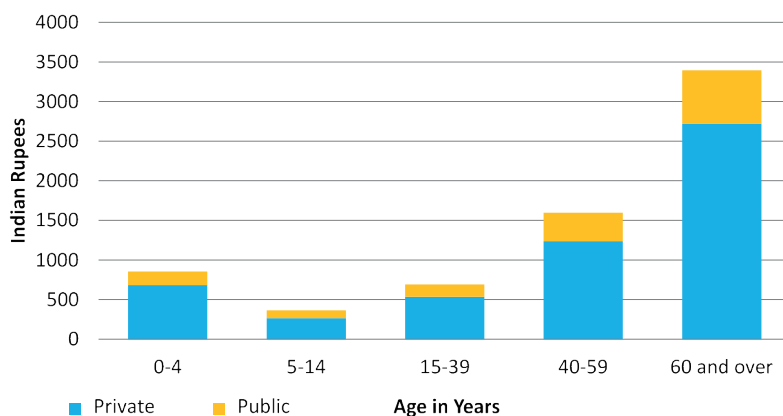
Source: Mahal and Illesinghe (2015).

Household stress with respect to the health, including healthcare needs of the elderly, is not simply an issue of equity. It also has a significant political dimension in India's democratic polity. A recent pre-election survey in the country identified "better healthcare" as second-highest in the priority list of voters after "better employment opportunities", and health generally appears among the top ten issues of concern to Indians (Economic Times 2019). The growing healthcare needs of the population as it ages are, therefore, increasingly likely to show up in government budgets.

Will the Ayushman Bharat scheme address the financial burden of illness among the elderly?

Perhaps the most significant development addressing elderly concerns in India in the last decade is the emergence of multiple central and state government-funded hospital insurance programmes for the less well-off. Prior to their introduction (the first scheme was introduced in 2007), healthcare benefits were accessible through social insurance programmes for the small number of formal sector workers. Subsidised government healthcare services have always been available to all for free, but have traditionally been underbudgeted and poorly run, leaving vast numbers of people dependent on private care that was paid for out of pocket.

Although state-funded hospital insurance schemes were not specifically intended for the elderly, the treatments covered under these schemes targeted many of the conditions (heart disease, diabetes, etc.) that are widely prevalent among older individuals. Moreover, these schemes focused on poor households, thus benefiting the elderly in the most vulnerable population groups. However, their coverage was variable and often incomplete, with low rupee coverage limits and no coverage for outpatient spending. Funding for these schemes was limited: in 2016, the most recent year for which health financing data are available, government-funded hospital insurance schemes accounted for only 1% (about 50 billion rupees) of the national health expenditure of almost 5 trillion rupees. Consequently, the burden of out of pocket spending on households continues to be high (Karan et al. 2017).

The Ayushman Bharat Yojana (ABY), introduced by the Indian government in September 2018, is intended to reflect learnings from previous health sector experience in India: it offers much larger inpatient benefits in the amount and conditions covered in its hospital insurance component, covers more people (almost 500 million or the poorest 40% of India's population), places no limits on household members covered, and seeks to address gaps in outpatient services in the form of almost 150,000 health and wellness centres spread throughout the country. Geriatric services are planned at these centres. Almost 28 million households (or more than 100 million people) have been enrolled to date under the programme, and more than 15,000 public and private hospitals have been empanelled to provide services financed by ABY.[2]

ABY has the potential to substantially enhance protection against financial shocks from illness and improve health service delivery to less well-off Indians, especially the poor elderly. However, previous experience suggests areas for additional policy effort, such as limited resources that constrained state-level hospital insurance plans.

2　See https://www.pmjay.gov.in/.

If we assume, for example, that hospital utilisation rates of the bottom 40% of Indians rise to the level of the top quintile (following the introduction of benefits under ABY), this would result in an extra cost of almost 1,000 billion rupees for 500 million Indians, almost 12 times the current budgetary provision for ABY (according to our calculations).

In the longer run, another fiscal threat may emerge if middle- and upper-income groups, who are currently excluded from the hospital insurance programme of ABY, begin pressuring the government to join the programme. Policymakers are implicitly assuming that this group will be covered by private health insurance coverage, which has expanded rapidly in India in recent years (Insurance Regulatory and Development Authority of India 2018). But private health insurance in India is not well regulated and has focused on covering younger and healthier individuals. Data from the most recent round of the nationally representative India Human Development Survey show that only 5% of individuals covered by private health insurance were older than 70 years. If older and sicker individuals from middle- and upper-income households lose private insurance coverage over time and clamour to join ABY, the fiscal footprint of the scheme could expand considerably.

ABY benefits will only accrue to the elderly if they are aware of the programme benefits and in a position to use them. This can be especially problematic for the poor disabled elderly or the very old, who are often left out of social transfer schemes for which they are eligible (Asri 2017). Although the focus is on the less well-off, neither the state health insurance plans nor ABY make special provisions for targeting households containing the elderly.

The 150,000 health and wellness clinics are expected to provide a range of prevention and health promotion programmes, including for chronic conditions, and geriatric services. Well-functioning primary care can lower aggregate hospitalisation expenses (and thus the fiscal burden of ABY) and provide services in proximity to people. However, provision of primary care services of adequate quality has been a longstanding challenge in India, with major shortages of human resources, including doctors and qualified nurses. Recent work in India and elsewhere also shows that even when trained health workers in the public sector are available, the services provided are of inadequate quality (Das and Hammer 2014).

Possible solutions

ABY is an important step towards financial risk protection and promotion of the health of India's population, including the elderly. However, its further development needs to be accompanied by other steps. A critical first step must be a political commitment to

allocate adequate resources. By our estimates, at least a doubling of the current share of public spending in GDP is required to around 2%. A useful contrast here is with China. In 2000, both China and India allocated a roughly similar share of GDP to health from their budget, a little less than 1%. By 2016, China's share had increased rapidly to 3% of GDP, while India's public spending on health continued to hover at around 1% of GDP.

Figure 3   Public spending on health as a share of GDP in China and India
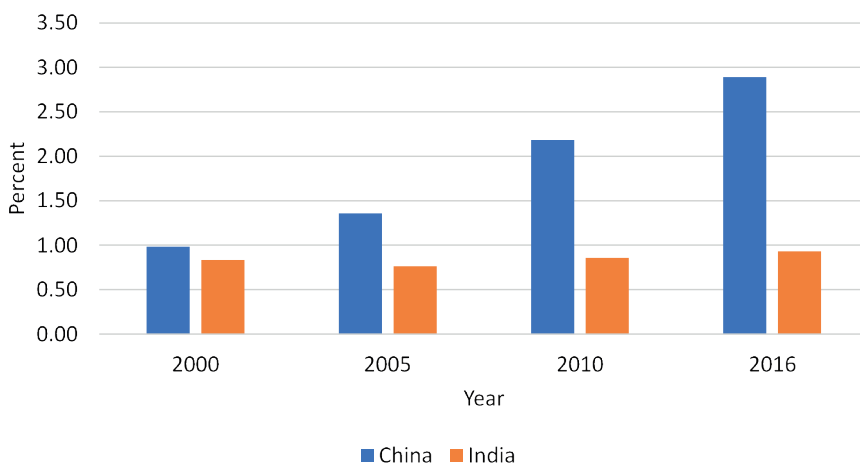
Source: World Development Indicators Database.

Increased spending on health is unlikely to be enough. The funds would also need to be spent effectively. Human resources are an area of concern. While incentives around service delivery and absenteeism attract much attention, many frontline workers are also poorly motivated because they are inadequately trained, lack opportunities for continuing medical education and advancement, and bear a heavy patient workload. Although not directly relevant to geriatric care, recent research on programmes that place nurse mentors on mentoring nurses at primary health centres in Uttar Pradesh and Bihar in India yielded significant improvements in quality of care and availability of equipment and drugs (Mahal 2018). And ABY's emphasis on using frontline health workers at health and wellness centres is confirmed by recent evidence on the effectiveness of training Accredited Social Health Activist (ASHA) workers for prevention and health promotion activities related to chronic conditions (Abdel-All et al. 2018).

Targeting ABY benefits to the poor and disabled elderly is not readily resolved as inclusion and exclusion errors are common to most targeting mechanisms with much depending on implementation (Devereux et al. 2017). Moreover, this group is least

likely to self-select into the programme. The optimal strategy may well be to incentivise enrolment of such groups by ABY personnel, perhaps by classifying households containing the elderly as a priority group.

A longer-term vision for the health insurance sector needs to accompany ABY. This includes paying close attention to the developments in the private health insurance sector, an important safety net for the non-poor elderly. Here, India can learn much from the experiences of other countries with a large private health insurance sector. Key among these are regulatory efforts that limit risk selection among insurers, including requiring community risk rating for determining insurance premiums, uniform minimum benefits packages, reviews of premium increases and guaranteed renewal of insurance policies, and compensating insurers who end up with riskier enrolees by those with healthier enrolees (Mahal 2002).

Each of these additional steps is significant in its own right. But as Berkman et al. 2012) point out, there is a social and economic imperative to addressing the needs of the Indian elderly. Instead of being viewed as consumers of resources, they provide significant caregiving support of their own for grandchildren in the household. Moreover, grandparenting can contribute to increased labour force participation among Indian women which, at about 35%, is significantly below their male counterparts (at 81%) (Dutta and Hussain 2014). Perhaps the prognosis of ageing for economic growth is not so grim after all.

References

Abdel-All, M et al. (2018), "Evaluation of a training program of hypertension for Accredited Social Health Activists (ASHA) in rural India", *BMC Health Services Research* 18: 320.

Ahmad, J, F Blum, P Gupta and D Jain (2018), *India's Growth Story*, The World Bank.

Asri, V (2017), "Targeting of social transfers: Are India's elderly poor left behind?", Asian Development Bank Institute Working Paper 779.

Berkman, L, T Sekher, B Capistrant and Y Zheng (2012), "Social networks, family and caregiving among older adults in India", in J Smith and M Majumdar (eds), *Ageing in Asia: Findings from New and Emerging Data Initiatives*, National Academies Press.

Cherian, M (2015), *State of Elderly in India* 2014, HelpAge India.

Das, J and J Hammer (2014), "Quality of primary care in low income countries: facts and economics", *Annual Review of Economics* 6: 525-553.

Devereux, S, E Masset, R Sabates-Wheeler, M Samson, A Rivas and D Lintelo (2017), "The targeting effectiveness of social transfers", *Journal of Development Effectiveness* 9(2): 162-211.

Dutta, M and Z Hussain (2014), "Presence of grandparents and labour market outcomes of mothers", Institute for Economic Growth.

Economic Times (2019), "Jobs, healthcare, drinking water top priorities for voters: survey", 26 March.

Insurance Regulatory and Development Authority of India. 2018. *Annual Report 2017-18*. Hyderabad: IRDAI.

Karan, A, W Yip and A Mahal (2017), "Extending health insurance to the poor in India: An impact evaluation of Rashtriya Swasthya Bima Yojana on financial risk protection", *Social Science and Medicine* 181: 83-92.

Mahal, A (2002), "Assessing private health insurance in India: potential impacts and regulatory issues", Economic and Political Weekly 37: 559-71.

Mahal, A (2018), "The implications of alternative nurse mentoring programs for delivery-related services: Quantitative evidence from three programs in Bihar and Uttar Pradesh", Nossal Institute for Global Health.

Mahal, A and A Karan (2019), "The impact of RSBY on female labor force participation in India: a matched difference-in-differences analysis", Nossal Institute for Global Health.

Pandey, A, L Clarke, G Ploubidis and L Dandona (2018), "Trends in catastrophic health expenditure in India: 1993 to 2014", *Bulletin of the World Health Organization* 96(1): 18-28.

Pension Parishad (2018), *State of Pensions in India 2018*, HelpAge India.

Prabhakaran, D, P Jeemon and A Ray (2016), "Cardiovascular diseases in India: current epidemiology and future directions", *Circulation* 133: 1605-1620.

Prasad, N and P Raghavendra (2012), "Healthcare models in the era of neo-liberalism: A study of Aarogyasri in Andhra Pradesh", *Economic and Political Weekly* 47(43) :118-26.

Press Information Bureau (2018), "Prime Minister lays the foundation stone of the National Centre for Ageing at AIIMS", Government of India.

About the authors

Ajay Mahal is a Professor of Health Economics and Health Systems at the Nossal Institute for Global Health at the University of Melbourne (Australia). He was previously the Alan and Elizabeth Finkel Chair of Global Health at Monash University and has served as an Associate Professor at Harvard University. Dr. Mahal holds degrees from Columbia University (Ph. D in Economics, 1995) and the University of Delhi (M.A. (Economics), 1986; B.A. (Economics), 1984). His research interests span a range of economically relevant questions pertaining to health financing and health sector reform, household and national level impacts of (ill) health, ageing and its implications for health systems, and the design and evaluation of health system interventions.

Sanjay K. Mohanty is a Professor at International Institute for Population Sciences (IIPS), Mumbai, India. He teaches Health Economics and Demographic Methods at IIPS, Mumbai. He has guided several doctoral students and worked extensively in health financing and multidimensional poverty. Dr. Mohanty was C R Parekh Fellow at Asia Research Centre, London School of Economics during January-April 2010 and Visiting Scientist at Harvard T.H. Chan School of Public Health during September 2014- August 2015. He has authored more than 80 research paper in international and national peer reviewed journal. His research interest includes empirical research on health economics, measurement and applications of multidimensional poverty and economics of ageing.

15 Cutting Medicare beneficiaries in on savings from managed healthcare in Medicare

Thomas G. McGuire
Department of Health Care Policy, Harvard Medical School

It is well-known that healthcare costs consume a large fraction of national income, ranging from about 10% to near 20% for the US. Not so well known is that even those with coverage from public health insurance may spend large shares of their income on health insurance or out-of-pocket at the time of service. In many countries with mandatory individual health insurance, consumers pay nearly all, or a large share, of their health insurance premiums. In Switzerland, for example, consumers pay for their own health insurance; in the Netherlands, consumers pay about half of the premiums with the balance being tax-financed. Additionally, consumers may face cost-sharing at the time of service, or elect to supplement public insurance with some private health insurance coverage. Thus, in countries in which individual health insurance is the basis of national policy, the public has an interest in promoting the choice of cost-effective health insurance coverage. Encouraging efficient choices requires 'cutting in' enrolees on the cost savings they may achieve through the choice of less expensive forms of coverage. In this chapter, I use the Medicare programme in the US as an example of how cutting in can be done more effectively.

The federal Medicare programme helps pay healthcare costs for 60 million Americans through a combination of Traditional Medicare (TM), the default option for elderly beneficiaries featuring open provider networks and no managed care, and private insurance alternatives through the Medicare Advantage (MA) programme. Health plans in MA are managed care plans, modelled on and sometimes identical to plans active workers choose from among those offered by their employer. Medicare beneficiaries may also buy coverage for prescription drugs from private insurers, and they may buy supplemental coverage from private insurers to cover some of the out-of-pocket costs not otherwise paid by TM.

While the elderly in the US treasure Medicare, it affords incomplete protection from healthcare costs. A recent study from the Kaiser Family Foundation (Cubanski et al. 2018) reports that in 2013, a Medicare beneficiary's average out-of-pocket costs for healthcare spending totalled $5,503 (including any premiums to private health insurance) and this consumed 41% of the average Social Security benefits. The percentage was projected to rise to 50% ten years from now. While the primary driver of the high and increasing economic burden of healthcare costs on the elderly is of course high and rising healthcare costs per se, Medicare could do more to cut the elderly in on the savings in costs from managed healthcare.

Managed care in Medicare generates potential savings. Curto et al. (2019) estimate that per person spending, after adjusting for geography and risk score, is 25% lower in MA than in TM, with the savings generated from fewer services roughly across-the-board (rather than from differences in prices paid). Who benefits from these savings? MA plans in the form of profits? Medicare/taxpayers in the form of lower programme payments? Beneficiaries in the form of lower premiums to join an MA plan?

The Medicare payment rules are intended to use competition among health plans to divide the savings between Medicare (taxpayers) and its beneficiaries. The idea is simple. Within what is referred to as 'regulated' (or 'managed') competition, an idea first espoused by Alain Enthoven (1993), health plans would compete by designing their product in terms of coverage, networks, and other features, and by the premium charged to enrolees. Plans with the best combinations of product and price would win the most customers. Regulated competition encourages plans to both offer benefits/ coverage that are valued by consumers and to compete on price to attract buyers. As in the case in markets generally, if competition is vigorous enough, competitors would be forced to pass any savings (from a technology, like managed care, available to all plans) on to buyers.

A version of regulated competition is in place in MA (McGuire and Newhouse 2018). MA plans are required to put in a 'bid' to determine the price they would be paid for a beneficiary of average risk. If the bid is below the 'benchmark' (a Medicare term for what a beneficiary of average risk would cost Medicare in TM in that geographic area), the 'savings' (i.e. the difference between the costs for an average beneficiary in TM and an average risk beneficiary in the MA) are divided 50/50 between reducing Medicare payments (benefiting taxpayers) and reducing cost-sharing/lowering premiums (benefiting beneficiaries joining the plan). In principle, this version of regulated competition could work to foster MA plans with benefit/premium combinations that pass on the savings from managed care to beneficiaries.

Two features of MA interfere with the passing of savings through to beneficiaries. The first is that many MA markets, like many health insurance markets more generally, are not highly competitive. On average, the supply side of many local MA markets is highly concentrated. In the majority of counties, the top three insurers account for 90% of the market. In 2015, there were an average of only 3.2 plans per county. Lack of competition allows sellers to increase their price and/or decrease the quality of their product. One way to encourage plans to pass through savings is by vigorous competition policy in MA that, for example, prohibits mergers among firms that already have substantial market shares.

A second feature of the MA programme that interferes with passing savings to consumers may be easier to fix than attempting to change the market structure of supply of health insurance. Medicare presents premium prices to its beneficiaries in a particular way. If the MA plan submits a bid above the Medicare benchmark, the plan is required to charge the bid-benchmark difference as a premium increase to the beneficiary. I say 'premium increase' because every beneficiary pays a standard 'Part B premium', whether they stay in TM or opt to join MA. The issue is that for most beneficiaries, the mandatory Part B premium is automatically deducted from their Social Security cheque each month. This means that if the beneficiary is paying an increased premium due to a bid-benchmark difference, the beneficiary writes a cheque. If the beneficiary joins a plan where the bid is less than the benchmark, any premium reduction takes the form of a lower automatic deduction from the Social Security cheque. The beneficiary sees and feels a premium above the mandatory Part B premium, but does not see or feel the premium below the mandatory premium. McGuire and Newhouse (2018) argue that this price-framing asymmetry creates a 'kink' in beneficiary demand for an MA plan – the beneficiary is responsive to the price increase above the mandatory premium, but relatively unresponsive to a price below the mandatory amount. Decreased demand response, put another way, is lower price elasticity of demand, and low price elasticity of demand is what gives monopoly power to a seller, exacerbating any market power and elevating prices due to few sellers.

Pelech's (2018) study of competition, benefits, and premiums in MA finds evidence for both of these potential barriers preventing market-driven transfer of savings to beneficiaries. The author studied exogenous changes in competition in local markets for MA and found that competition encouraged plans to provide more coverage and benefits to beneficiaries, but in the case of plans charging exactly the Medicare Part B premium ('zero-premium' plans), there was no change in premium, i.e. no breaking away from the 'zero premium'. By contrast, plans already charging a positive premium above the Medicare Part B premium both increased benefits and reduced premiums in response to competition.

A simple administrative change could ameliorate the artificial demand inelasticity created by Medicare pricing rules, addressing at least one of the two barriers to passing managed care savings on to beneficiaries. Beneficiaries could be allowed to deduct both the mandatory Part B premium and the MA premium (positive or negative) from their social security cheque. Information about these charges could be displayed to beneficiaries on the Medicare Plan Finder website, levelling the playing field between MA plans that are more expensive and charge higher prices and their competitors who are less expensive and charge lower prices. Increasing demand response to low prices increases the rewards for a plan from lowering those prices, thereby passing more of the savings to beneficiaries, as intended in the design of managed competition in Medicare.

References

Cubanski, J, T Neuman, and K E Smith (2018) "Medicare beneficiaries' out-of-pocket health care spending as a share of income now and projections for the future," Kaiser Family Foundation.

Curto, V, L Einav, A Finkelstein, J Levin and J Battacharya (2019), "Health care spending and utilization in public and private Medicare", *American Economic Journal: Applied Economics* 11(2): 392-332.

Enthoven, A (1993), "The history and principles of managed competition," *Health Affairs* 12: 24-48.

McGuire, T and J Newhouse (2018) "Medicare Advantage: Regulated competition in the shadow of a public option," in T McGuire and R Van Kleef (eds) *Risk adjustment, risk sharing and premium regulation in health insurance markets*, Elsevier.

Pelech, D (2018), "Paying more for less? Insurer competition and health plan generosity in the Medicare Advantage program", *Journal of Health Economics* 61: 77-92.

About the author

Thomas G. McGuire is a Professor of Health Economics in the Department of Health Care Policy at Harvard Medical School. He is a Research Associate at the National Bureau of Economic Research and a member of the National Academy of Medicine. He was a coeditor of the *Handbook of Health Economics Volume 2*, and served for ten years as an editor of the *Journal of Health Economics*. McGuire's research focuses on the design and impact of health care payment systems, the economics of health care disparities,the pharmaceutical sector, and the economics of mental health policy.

16 Macroeconomics and policies in ageing societies

Andrew Mason†, Sang-Hyop Lee‡, Ronald Lee* and Gretchen Donehower*[1]
East-West Center†; University of Hawaii‡; University of California, Berkeley*

Population ageing is virtually certain. A large asteroid could strike the earth. Or a crazed political leader could start a thermonuclear war. But barring a cataclysmic event of this sort, populations around the world will grow older with each passing year. The meaning of population ageing and how it will influence our societies is far from clear, however. Is 75 the new 65? Can people work into their 70s? Will meeting the needs of the elderly leave us mired in debt? Is economic decline on the horizon? Addressing these and many other questions about the economic implications of population ageing is an important and challenging task.

In this brief essay we touch on three broad themes. The first is that we need better information about what we call the generational economy. The second is the importance of pursuing policies that maximize economic growth as properly defined. The third is the need for pursuing gender and generational equity.

Better Information about the Generational Economy

Sound policy requires better information about the generational economy because members of different generations face different economic opportunities and challenges and value different policy priorities. In a poor country, fulfilling basic needs is a high priority for all generations. As countries become richer and as age structure changes people spend more on each child, especially on education; the elderly rely more heavily on publicly funded pension programs and healthcare systems; and working-age adults often work fewer hours and retire at a younger age.

In pursuing these goals, generations compete with each other for scarce resources—both money and time. Parents, particularly mothers, sacrifice their own needs when they make heavy investments in their children. So do taxpayers who support public education and child health programs. Pensions and health-care systems that benefit the elderly rely heavily on taxes and social contributions that fall mostly on prime-age adults.

Variety is a universal feature of the generational economy, as illustrated by estimates for Japan and Nigeria (Figure 1). Consider the upper panels that compare per capita age patterns of consumption and labor income. In both countries, children and the elderly consume far more than they produce through their labor. In Japan, the gap between consumption and labor income for children is very large, reflecting strong commitments to education. Large gaps for the elderly reflect extended periods of retirement and high spending on health care. In Nigeria, and in most other lower-income countries, per capita consumption by the elderly is similar to consumption at working ages.

Figure 1   Consumption and labor income by age, Japan and Nigeria 2004
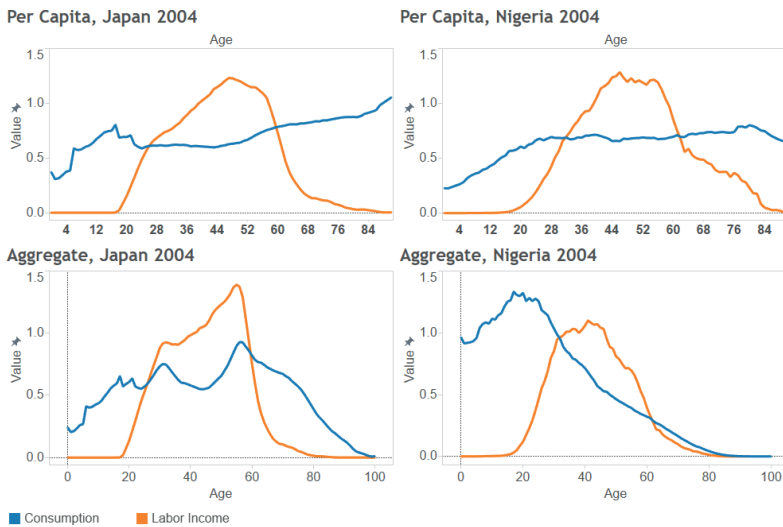
Note: Per capita and aggregate values, respectively, are expressed relative to the simple average of per capita and aggregate labor income in the 30-49 age range.

Notes: Per capita and aggregate values, respectively, are expressed relative to the simple average of per capita and aggregate labor income in the 30-49 age range.

Source: Lee and Mason (2011); www.ntaccounts.org accessed January 18, 2019

The lower panels of Figure 1 show aggregate consumption and labor income for the population. Japan has a very old population and, hence, a large old-age deficit. Nigeria has one of the youngest populations in the world with a very large deficit at young ages and a very small old-age deficit.

These age deficits are funded in different ways. Public programs support children and the elderly by relying on taxpayers, while families make private intergenerational transfers. Young adults and the elderly may also use income from capital (including debt) to generate resources needed early and late in life. Estimates for 28 countries (Figure 2) reveal different ways of funding the lifecycle deficit. The countries fall into three distinctive clusters. Seven have low public support for the elderly—Cambodia, El Salvador, India, Indonesia, Philippines, South Africa, and Thailand. In these countries, net public transfers to the elderly are typically near zero and never exceed 20 percent of the old-age deficit. In eight countries—China, Japan, South Korea, Taiwan, Australia, Mexico, United Kingdom, and the United States—public support for the elderly is moderate, with net public transfers to the elderly ranging from 36 percent to 57 percent of the old-age deficit. In 13 countries—Austria, Brazil, Costa Rica, Ecuador, Finland, France, Germany, Hungary, Italy, Peru, Slovenia, Sweden, and Uruguay—net public transfers are high, ranging from 63 percent to 114 percent of the old-age deficit (Mason and Lee 2018).

Figure 2   Public transfers, private transfers, and asset-based reallocations (use of asset income or dissaving to fund consumption) as a percentage of the lifecycle deficit for persons 65 and older in 28 countries.
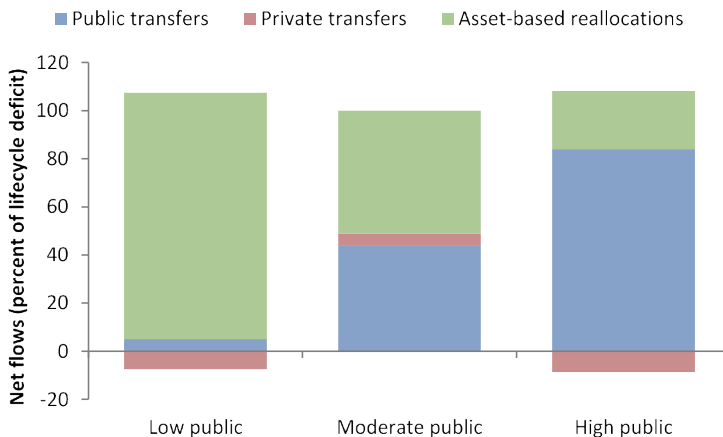
Note: Values are simple averages of values for countries in each group.

Source: Mason and Lee (2018).

The elderly who live in countries with limited public programs can turn to their families for support, or they can rely on assets accumulated when younger. Family support is still important in some East Asian countries, but it is declining over time. Outside East Asia, the elderly typically provide at least as much

economic support to family members as they receive, and often more. In countries with weak public programs the elderly rely on assets to fund old-age needs. In India, for example, asset-based reallocations (asset income less savings) fund 95 percent of the old-age deficit, while in Germany and France, where public support is high, asset-based reallocations fund only about 35 percent of the old-age deficit. The importance of assets for old-age support in India and other lower-income countries is a surprise to many people who may overlook the importance of a small farm or business or the flow of services from an owner-occupied residence. In recent years more researchers and policy makers have come to appreciate the importance of understanding the functioning of the generational economy in their own country. Maintaining up-to-date information is essential to assess the impact of changing public policies and how gender and economic class interact with public pension systems, labor markets, and family policies. National statistical agencies should play a more active role in compiling and disseminating comprehensive data about the generational economy.

Is Slower Economic Growth Inevitable?

After favoring economic growth for decades, demographic change may be a source of economic decline (Bloom and Williamson 1998; Mason and Lee 2007). In 2015, eight G20 countries enjoyed growth in the number of effective workers (labor force adjusted for age variation in unemployment, hours worked, and productivity) in excess of growth of the number of effective consumers (population adjusted for age variation in public and private consumption). In 11 other G20 countries, however, the effective number of workers was growing more slowly than the effective number of consumers, depressing growth by one-half a percentage point per year or more in France, Italy, Japan, and Russia.

By 2035, only South Africa among G20 countries is projected to still be enjoying favorable growth in the working-age population. The anti-growth effects of a shrinking share of the working age population are projected to be particularly strong in Italy, Japan, and the Republic of Korea.

Anti-growth effects of aging may be countered by favorable effects on capital and worker productivity (Mason and Lee 2007). After a lifetime of accumulation, seniors are typically the wealthiest members of society. Heavy reliance on public debt and public transfers to the elderly, however, may reduce saving incentives. Aging also has an important connection to human capital, because low fertility leads to more education and a more skilled labor force (Mason, Lee and Jiang 2016).

In our own analysis of these issues, we conclude that moderately low fertility, in the range 1.6 to 2.0 births per woman, need not lead to lower standards of living. But standards of living are likely to decline in countries with super-low fertility, below 1.5 births per woman. While liberal immigration policies in these countries can be helpful, raising fertility is important. Policies to address super-low fertility are particularly attractive when they provide multiple benefits. For example, public spending on education enhances productivity and reduces the costs of childrearing to parents. Child subsidies encourage couples to have more children and reduce inequality. Support for young mothers may raise fertility and reduce barriers faced by women in the job market. But even with well-designed policies, public transfer programs will face severe strains, and standards of living are likely to grow more slowly than in the past or even decline in countries with super-low fertility (Lee, Mason and Members of the NTA Network 2014).

Address Generational and Gender Equity

For the world as a whole, average consumption by seniors and prime-age adults is similar. In individual countries, however, they can differ greatly. In two G20 countries, United States and Japan, seniors consume about one-third more than prime-age adults, while in four G20 countries, South Africa, Mexico, China, and the Republic of Korea, they consume at least 10 percent less (Figure 3).

Children and the elderly in rich, aging countries tend to have high consumption, falling in the northeast quadrant of Figure 3. Children and the elderly in young, lower-income countries often fall in the southwest quadrant of Figure 3 with low spending on children and the elderly relative to spending on prime-age adults.

Both anti-growth changes in age structure and generational inequity can be offset, at least in part, by effective policy: raising retirement ages, reducing age or gender discrimination in employment practices, promoting lifelong learning, increasing labor flexibility, helping parents combine market labor and childrearing, and reducing excessive spending at older ages, e.g., wasteful spending on health care. Measures of economic activity that overlook unpaid care seriously underestimate women's role in national economies, misestimate consumption and production in the generational economy, and hinder good policy design. Policies designed to encourage female labor force participation will have greater success if they address women's existing unpaid care work. Welfare policy in aging societies should anticipate future increases in demand for family-provided eldercare. Policies to encourage fertility through child subsidies must recognize that in many countries, the value of unpaid care time consumed by young children is far greater than the conventionally measured value of the market goods

and services that children consume (Varga and Donehower 2019). A full accounting of women's economic contribution that includes unpaid care work will lead to policies that promote gender equality and enhance macroeconomic growth.

Figure 3 Consumption by children (0–24) and seniors (65+) relative to consumption by adults age 25–64, estimate as of 2015, 180 countries classified by income group.
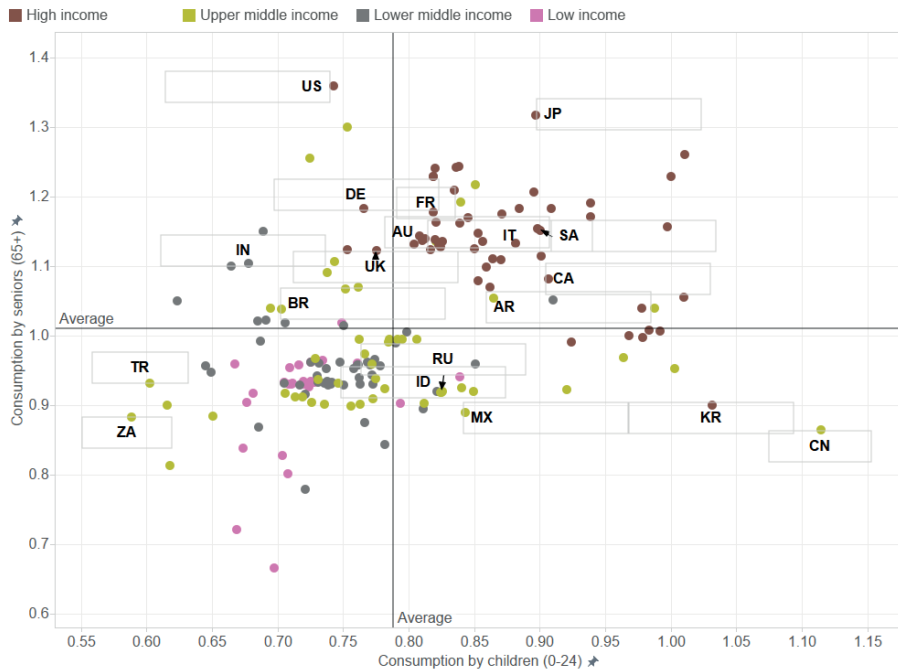
Note: Consumption levels by children (0-24) and seniors (65+) are per capita values expressed relative to consumption by persons 25–64. Both public and private consumption are included. G20 countries are labelled.

Source: Mason et al. (2017).

References

Bloom, D E and J G Williamson. 1998. "Demographic Transitions and Economic Miracles in Emerging Asia." *World Bank Economic Review* 12(3):419-456.

Lee, R, A Mason, and Members of the NTA Network. 2014. "Is low fertility really a problem? Population aging, dependency, and consumption." *Science* 346(6206):229-234.

Lee, R and A Mason, principal authors and editors. 2011. *Population Aging and the Generational Economy: A Global Perspective*. Cheltenham, UK: Edward Elgar.

Mason, A and R Lee. 2007. "Transfers, Capital, and Consumption over the Demographic Transition." Pp. 128-162 in *Population Aging, Intergenerational Transfers and the Macroeconomy*, edited by R Clark, A Mason, and N Ogawa. Cheltenham, UK; Northampton, MA, USA: Elgar Press.

—. 2018. "Intergenerational Transfers and the Older Population." Pp. 187-214 in *Intergenerational Transfers and the Older Population*, edited by The National Academies Press. Washington, DC: National Academies of Sciences, Engineering, and Medicine.

Mason, A, R Lee, M Abrigo, and S-H Lee. 2017. "Support Ratios and Demographic Dividends: Estimates for the World." *United Nations Population Division Technical Report*.

Mason, A, R Lee, and J X Jiang. 2016. "Demographic Dividend, Human Capital, and Saving: Take it now or enjoy it later?" *The Journal of the Economics of Ageing* 7:106-122.

Varga, L and G Donehower. 2019. "The Quantity-Quality Tradeoff: A Cross-Country Comparison of Market and Nonmarket Investments per Child in Relation to Fertility." *Population and Development Review*, 45(2): 321-350.

About the authors

Andrew Mason is Senior Fellow at the East-West Center, Honolulu, Hawaii and Emeritus Professor of Economics, University of Hawaii at Manoa. He is a member of the Center for the Economics and Demography of Aging (CEDA) at the University of California, Berkeley. Mason and Ron Lee co-founded the National Transfer Accounts (www.ntaccounts.org) network, an international effort involving teams from over seventy countries developing and applying a comprehensive approach to measuring and studying the generational economy. Mason has authored or co-authored 150 journal articles and book chapters and co-authored or co-edited thirty books and monographs including *Population Aging and the Generational Economy: A Global Perspective*, a finalist for the Paul A. Samuelson Award and selected as an Outstanding Academic Publication by Choice Magazine. He earned a Ph.D. in economics from the University of Michigan.

Sang-Hyop Lee is Professor in the Department of Economics at the University of Hawaii at Manoa and Senior Fellow at the East-West Center. He is currently chairing the Executive Committee of the National Transfer Accounts (NTA) project (www. ntaccounts.org). His works particularly focus on issues related with individual and population aging such as social welfare, fiscal policy, pension, healthcare, and labor market issues. Dr. Lee has been investigator of numerous projects related with these issues and has collaborated with many international agencies. Dr. Lee received his BA and MA in economics from Seoul National University, and PhD in economics from Michigan State University.

Ronald Lee is an economic demographer (Berkeley MA, Harvard PhD) who taught in the departments of Demography and Economics at Berkeley from 1979-2014, and now does research on macroeconomic consequences of population aging. From 2010-2015 he co-chaired a National Academy of Sciences Committee on the Long-run Macroeconomic Effects of the Aging U.S. Population. He also continues to work on modeling and forecasting demographic variables including mortality, and on evolutionary biodemography and life history theory. He is the Founding Director of the Center for Economics and Demography of Aging (CEDA) and founding co-Director of National Transfer Accounts (NTA). He is an elected member of National Academy of Sciences and four other honorary societies.

Gretchen Stockmayer Donehower is a research specialist with the Center on the Economics and Demography of Aging at the University of California at Berkeley and an adjunct fellow of the East West Center. Her work includes the National Transfer Accounts (ntaccounts.org) project to measure the generational economy. She is the Principal Investigator of Counting Women's Work (countingwomenswork.org), which adds the gender dimension to the generational economy measured by NTA and includes unpaid care in the framework. She has a BA in economics and mathematics from Yale University, and an MA in statistics and PhD in demography from the University of California at Berkeley.

17 Population ageing and tax system efficiency

John Laitner and Dan Silverman
University of Michigan; Arizona State University

As the US population ages, it is putting increasing pressure on the fiscal system. It means more and more older people receiving more and more benefits such as Medicare and Social Security. The bill for those benefits, which already totals nearly $1.8 trillion a year, is paid for largely by payroll taxes on younger, working people who are, relatively speaking, becoming rare. There are now roughly four working-age people for every person aged 65 and older in the US. Less than 20 years ago, before the baby-boomers started to retire in earnest, there were five working-age people for everyone over the age of 65.

The year 2020 will represent an important milestone on the fiscal path forged by population ageing. Next year, the US government anticipates that, for the first time since 1982, Social Security benefit spending will exceed the system's various sources of income. In other words, the money spent on Social Security will outstrip the payroll tax receipts and interest received on the reserves held in the system's Trust Fund. Indeed, by 2035 that Trust Fund will be depleted and, from that point forward, tax income is expected to be enough to cover only 75% of the benefits scheduled to be paid over the next 60 years.

Given these facts, it is natural for discussions about Social Security reform to focus on the system's solvency and for policymakers to debate what seem like inevitable and unpleasant turns to higher taxes or reduced benefits.

Nevertheless, we think this view of Social Security reform is needlessly gloomy. It overlooks the potential for changes to the Social Security system that can achieve efficiency gains and thus relieve fiscal pressures in ways that benefit most Americans. In particular, we see ways to adjust the payroll taxes that support Social Security in ways that would create incentives for longer careers and produce important new revenues to fund the system.

We begin with a standard economic argument. The payroll taxes that fund Social Security generate the usual income and substitution effects of taxation. On the one hand, by making work less lucrative, payroll taxes encourage workers to substitution into 'leisure', and produce a tendency to retire earlier. On the other hand, by making work pay less, payroll taxes imply workers are poorer and this income effect can inspire more work and longer careers. The benefits side of the Social Security also has income and substitution effects but, because of the way the benefits rules work, the substitution effect is very small, especially at older ages. If we do nothing to change the benefits schedule, therefore, the most promising path for producing efficiency gains inside the system is to change in the payroll taxes that fund it.

What might work? In a paper published in the Journal of Public Economics (Laitner and Silverman 2012), we proposed a simple Social Security reform aimed at alleviating the primary incentives for earlier retirement that the current system may create. The proposed reform would establish a long vesting period (say, 34 to 40 years of contributions). After vesting, a worker would no longer face the old age and survivor's insurance (OASI) payroll tax, his benefits schedule as a function of retirement age would be fixed, and he would not face any 'earnings test'. In fact, we would maintain the existing benefit formula, but base it only on earnings prior to the vesting age. Individuals who continue to work after vesting would thus receive a 10.6% payroll tax reduction. To maintain revenue neutrality within the system, there would be a small increase in the payroll tax during the vesting period, somewhere along the lines of 0.25% to 0.5%.

The logic of the proposed reform is straightforward and relates to a growing a literature on age-dependent taxation. That logic points to efficiency gains from using age to target lower tax rates at households with higher elasticities of labour supply. Intuitively, the reform aims to eliminate the substitution effects of Social Security taxes late in life, when labour supply is especially elastic, while leaving other potential distortions of the system unchanged.

In the paper we estimated and then simulated a model of work, spending, and savings decisions over a lifetime. The predictions of that model indicate that the proposed reform could raise retirement ages by more than a year, on average, and generate average efficiency gains of $4,000 per household (2005 dollars, present value age 50) or more. That means the average person would be willing to pay to live under this reform instead of the current system.

Perhaps most important, the model predicts that the reform would produce additional income tax (not payroll tax) revenues that average more than $14,000 per household. That extra tax revenue could be pumped back into the Social Security system and thereby long extend the system's projected solvency.

Alternatively, some of those extra income tax dollars could go towards reducing the small increase in the payroll tax we proposed for the vesting period. That might be especially welcome to those who can't extend their working lives much past the vesting period and therefore would not benefit from the tax relief after vesting. Nor should we overlook private household finances, which delayed retirement could aid as well. In recent decades the private pension system in the US has undergone rapid change. In the early post-WWII era, many workers enjoyed long-tenure jobs and those jobs often had generous defined benefit (DB) pensions. More recently, defined contribution (DC) pensions and individual retirement accounts (IRAs) have replaced many of the earlier plans. While DC pensions and IRAs have advantages in terms of portability and investment options, their prevalence, and benefits accrued, have so far tended to be smaller.

In fact, although life expectancies at, say, age 65 have tended to increase by almost a year per decade, private pension wealth has not kept pace. Using the same Health and Retirement Study dataset as the research described above, a working paper from the Michigan Retirement and Disability Research Center (Fang et al. 2016), for example, examines individual household balance sheets for adults aged 51-56 in 1992, 1998, 2004, and 2010. During the period, average household lifetime earnings rose about 25%. The capitalised value of expected Social Security benefits grew nicely in step. However, DB pension amounts fell – and growth in DC and IRA accounts was not fast enough to make up the difference. If our proposed reform to Social Security could induce men to work about 1.5 years longer before retiring, their extra earnings would largely counterbalance that shortfall. Although we can hope that in the future the newer pension forms will catch on better, policies that motivate longer careers could reduce the magnitude of adjustments that are needed.

Concerns about an ageing population are not limited, of course, to the US. Throughout the OECD, and more broadly, increased longevity and decreased birth rates are increasingly raising concerns about maintaining the wellbeing of the elderly without straining the forbearance of the young. According to the 2002 OECD Economic Outlook: "Future demographic trends reinforce the need … to reduce discouragement of labour … policy should ensure that the implicit tax on income from working an additional year … is close to zero …." (OECD 2002: 72). We think our arguments are applicable.

Our analysis thus suggests optimism for Social Security reform. It indicates a path by which some of the inefficiencies created by the system can be relieved without altering the fundamental promises that Social Security entails. More generally, we think there are many avenues by which policy can encourage longer careers and thereby relieve the fiscal strain of population ageing and promote retirement readiness among the future cohorts.

References

BOECD (2002), "Increasing Employment: The Role of Later Retirement", in *OCED Economic Outlook*, Volume 2002 Issue 2, OECD Publishing.

Fang, C, C Brown, and D Weir (2016), "Cohort Changes in Social Security Benefits and Pension Wealth", University of Michigan Retirement Research Center Working Paper, WP 2016-350.

Laitner, J and D Silverman (2012), "Evaluating the Efficiency of Reform that Encourages Longer Careers", *Journal of Public Economics* 96(7-8): 615-634.

About the authors

John Laitner is professor of economics at the University of Michigan, director of the Michigan Retirement and Disability Research Center, and research professor at the Institute for Social Research. His research focuses on macroeconomic theory, long-run growth, and public policy – in particular, social security (*Review of Economic Studies* 1988, *Journal of Public Economics* 2012), life-cycle saving (*Journal of Political Economy* 1990, *American Economic Journal: Macroeconomics* 2018)), bequest behavior (*Journal of Economic Theory* 1992, *American Economic Review* 1996), and technological change (*Review of Economic Studies* 2000, *American Economic Review* 2003). He received his Ph.D. in economics from Harvard.

Dan Silverman is Rondthaler Professor of Economics at Arizona State. He is a Public Economist who blends economic theory and econometrics to study how policies influence decision-making. His recent work levers "big data" and combines surveys with experiments to understand spending and saving choices, especially in the years leading up to and after retirement. Dan received a B.A. in Political Science from Williams College, an M.P.P. from Harvard University, and a Ph.D. in Economics from the University of Pennsylvania. He co-edits the *American Economic Journal – Economic Policy* and is a standing member of the NIH Social Sciences Studies Study Section.

18 Means-tested public pensions: Designs and impacts for an ageing demographic

George Kudrna and John Piggott
Centre of Excellence in Population Ageing Research (CEPAR), University of New South Wales

Population ageing and recent labour market trends pose significant challenges to social security systems around the world. According to the United Nations (2017), developed regions (Europe, North America, Australia, New Zealand, and Japan) will see their elderly populations more than double by 2050, while their working-age populations will continue to decline, threatening the sustainability of traditional earnings-related social security plans. Further, the decline of the traditional workplace raises new challenges for pensions that rely on the workplace as an anchor for pension fund membership (Mitchell and Piggott 2016). And fast growth of the contingent workforce in many countries has, and will have, serious implications for coverage and adequacy of contributory, earnings-related pensions.[1] Retirement system restructure to ensure fiscal sustainability, adequacy, and equity in the context of these fundamental demographic and labour market changes remains a major challenge for the governments of the Global North.

In developing countries, changing macro-demographic environments are causing the traditional family support system to break down. At the same time, many of these emerging economies have seriously deficient social protection policies, especially for the elderly. Major social policy development, including establishing comprehensive retirement income-support structures, will be required to avert large-scale poverty among older cohorts and to ameliorate pressures leading to increasing inequality.

In this chapter, we argue for a reorientation of pension policy formulation and reform towards non-contributory, means-tested pensions. Such pensions provide benefits to all people above age and residency thresholds, subject to means. Appropriately calibrated,

---

1 See, for example, Katz and Krueger (2016) and Gallup (2018) for the US workers engaged in the gig economy.

they can deliver adequate income to older cohorts, including those outside the reach of traditional pensions, such as rural workers, the very poor with limited labour force experience, and frequently, women – and in the future, many of today's contingent workers. Because the maximal benefit is a flat rate, and the benefit itself is means tested, it is an affordable and sustainable design. It can go a long way to meeting the poverty alleviation-related Sustainable Development Goals set by the United Nations in 2015.

Means-tested pensions are not uncommon, with about a third of countries worldwide having some form of a targeted public pension programme (Chomik et al. 2018). But in most cases such pensions are targeted at the very poor, and in many cases are an extension of a more general, non-age-related welfare programme. By contrast, we are advocating the development of a structure which delivers an age-based transfer large enough to be the major source of income for older people in, say, the bottom half of the income distribution. Rather than being directed towards the destitute, it targets the affluent. Until recently, this type of pension design has been the subject of little analysis. But over the last decade, a substantial literature has developed which supports this type of pension design as offering an attractive efficiency equity trade-off, while being sustainable and equitable in the face of an ageing demographic.

Broad structure

Means-tested pensions are designed to provide a poverty-alleviating income stream to older cohorts from some access age to the end of their lives. In an important sense, they are tied to needs, not entitlements earned through a contribution history. They have a distinctive feature that tailors the level of pension benefits to individual economic status – paying a higher benefit to poorer pensioners and reduced or no benefit to well-off seniors. This is done by setting up a 'maximal benefit' (benchmarked to economy-wide average wages) and then applying a 'taper' rate at which the maximal benefit is withdrawn in relation to the pensioner's income or assets. Means-tested pensions may also include a 'disregard' – an income or asset threshold up to which the maximal benefit is paid, to ensure that the pension for those seniors most in need is not impacted by small values of income or assets.

Through these three parameters, governments can effectively control the generosity, coverage, and overall cost of the programme. By implication it also controls the required tax rate and base to fund the programme. These outcomes are necessarily and continuously impacted by changes in labour supply and saving behaviours of

individuals. This means that the means-tested system has the capability to adapt to demographic change.

While not the primary focus here, it is important that a non-contributory pension is complemented by mandatory retirement saving for those who can afford it (Hayek 1960). This can be either funded or unfunded, a social security plan or a workplace pension – what is important in this context is that these entitlements count against the means test at retirement.

Economic benefits

Like any other tax-financed financial transfer, retirement income transfers impact on incentives at two points in economic transactions: when the tax is levied, and when the transfer is received.[2] These two points of price distortion are both relevant in assessing the efficiency and equity effects of a tax-transfer policy.

To capture both these points of intervention, it is necessary to adopt an economy-wide conceptual framework. Indeed, there are complex interactions between the effective tax rates facing those eligible to receive transfers, those not eligible, and those who are being taxed to finance it. First, while a means-tested pension programme will impose high effective tax rates on those receiving a partial benefit, where withdrawal of the pension is operative, many individuals potentially impacted by a universal pension will be unaffected by a targeted pension. The taper rate will impact on this. The lower the taper rate, the lower will be the incentive impact, but the more people will be affected. This is demonstrated in Figure 1, showing the association between the means-tested pension and private resources under the two taper rate cases – lower Taper_1 (red schedule) and higher Taper_2 (blue schedule). The lower taper implies lower tax rates with a smaller impact on incentives of those receiving a partial pension, but there are more beneficiaries (depicted by a wider range of private income or assets) that are impacted by this lower taper rate, compared to the higher taper scenario.

Furthermore, as the taper rate is reduced, the overall revenue requirement of the programme will increase, and this will require higher tax rates to be applied to others in the economy, probably workers. If they already pay high taxes, as in developed countries, then the incentive impacts are likely to be severe. If the economy is less developed, with low tax rates, it is likely that the tax imposition will retard the development of the formal sector. Overall, the best design will involve a somewhat subtle trade-off between

---

2   This and the next paragraph draw on the beginning of Section 3 in Kumru and Piggott (2010).

keeping a low tax rate for potential beneficiaries and keeping the tax burden of the economy at affordable levels.

Figure 1   Association between means-tested pension and private resources: Impacts of alternative taper rates
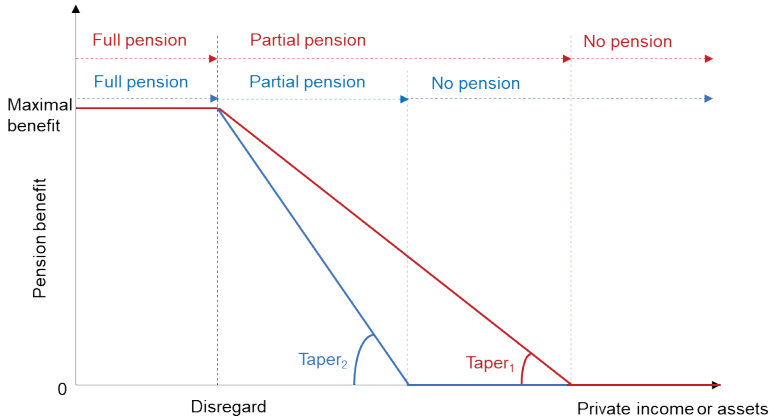
Over the last decade, a substantial empirical literature has been developed which offers strong guidance on the best means-tested designs, and illuminates other economic impacts.[3] Broadly speaking, these analyses show that a sharp taper dominates a shallow taper. The major welfare and macroeconomic improvements come from the reduced number of pensioners confronting the sharper taper, and the reduced income taxes needed to finance the programme, for any given maximal benefit.

The case for means testing public pensions strengthens under population ageing because of an adjustment mechanism embedded in means-tested pensions that automatically adjusts pension benefits to demographic change. If richer people live longer, and there is a single access age, then sharper means testing improves the equity impacts of a social pension by redistributing pension benefits to pensioners with limited private resources and shorter life expectancies. A further refinement separates out capital and labour income – offering more lenient taper treatment to the latter. This is shown to improve overall economic benefit further. A corollary to this is that focusing the taper on income from capital amounts to a capital tax. Yet overall negative impacts are limited, because

---

3   It is summarised in Chomik et al. (2015) and Kudrna (2016).

the relatively affluent, whose labour supply and saving is disproportionately important, receive no benefit, so their behaviour is not impacted.

These programmes therefore have direct policy relevance for pension reform in the Global North and for social security design in the Global South. They are also directly relevant to the OECD's concern with preventing ageing unequally (OECD 2017a).

A real-life example: Australia's age pension

The Australian age pension represents the main source of income in retirement for most retired Australians.[4] The age pension is needs based and has always been means tested. Eligibility is based on age (currently 65.5 and increasing to 67 by 2023) and residency (minimum 10 years), but not on work history and past earnings. Benefits are financed through general tax revenues. They are linked to full-time male average earnings, with the maximal rate for a single pensioner set at 28% and for each member of a pensioner couple at 75% of the single rate. By implication, benefits are indexed to wages.

Means test design

The age pension is subject to both income and asset tests. As illustrated in Figure 1, these tests are shaped around the maximal benefit that differs for single and couple pensioners, the disregard up to which the maximal benefit is paid, and the taper at which the pension benefit is withdrawn. The pension benefit paid to an eligible individual or household is then determined by a test that results in a lower pension amount.

The income test distinguishes capital income and labour earnings, with the latter enjoying a more generous disregard to encourage mature age labour force participation. Beyond the disregard, the maximal pension is reduced at the taper of 50 cents for every extra dollar of assessable income.

The asset test is comprehensive, although owner-occupied housing is exempt. It also distinguishes between homeowners and renters, with the asset disregard being higher for renters. Beyond the disregard, the maximal annual pension is reduced at the rate of 7.8 cents for every extra dollar of assessable assets. Currently, the cut-off amount of combined assets for a couple owning their home to receive any age pension is A$840,000 (12 times average annual earnings).

---

4   It is complemented by privately managed and provided superannuation (Australia's term for private pensions) that forms the second 'mandatory' and third 'voluntary' retirement income pillars.

Outcomes

The Australian age pension is an affordable and sustainable programme, with limited negative impacts on behaviour. Figure 2 offers estimates of international cost comparison. It shows public pension spending during 2013-2015 and projections for 2050-55 as a percentage of GDP (OECD 2017b). Australia's public spending on pensions is one of the lowest among OECD countries and far below the OECD average. Note that the figure of 4% of GDP for Australia includes not only the age and service pensions (about 2.9% of GDP in 2013-2015) that are means tested, but also spending on other public pensions (e.g. defined-benefit pensions for public servants, plans that are now closed to new entrants). Importantly, the projected expenditure for the 2050s is shown to decline slightly. This is mainly due to the means testing of the age pension and maturing mandatory superannuation with expected larger private savings at older ages.

When housing costs and imputed rent are included in the calculation, the Australian old age poverty rate is below the OECD average, indicating that the age pension also does a good job at poverty alleviation (Chomik et al 2018).[5]

Figure 2   Public pension spending in OECD countries, 2013-2055 (% of GDP)
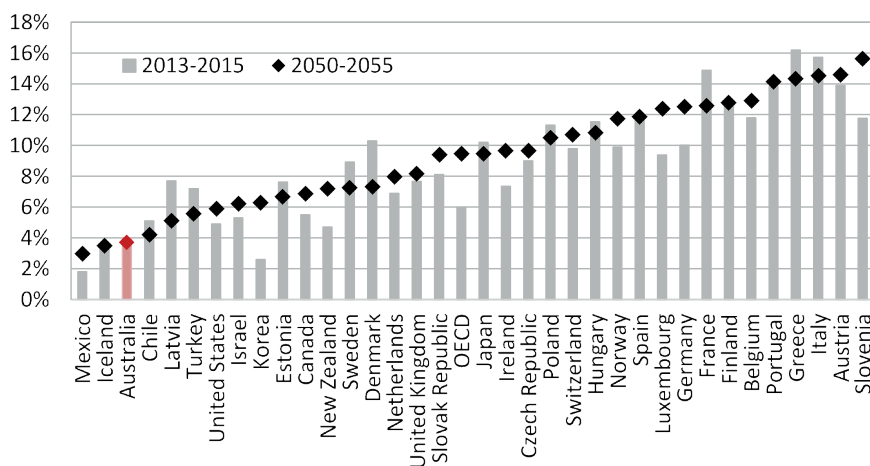
Source: OECD (2017b).

---

5   The OECD headline estimates of elderly poverty rates (OECD 2017b) are misleading. The calculation after taking account of housing costs is important because about 80% of elderly Australians own their home outright. Further, the age pension benefit is set just below the poverty line. Increasing the maximum pension benefit by a small amount would reduce old-age poverty more, for very little fiscal cost.

Australia has a century-long experience in administering the means test for the age pension. The approach is to integrate services and generate economies of scale and scope, with a single agency acting on behalf of client departments. The process involving assessment of income and asset information is streamlined, firstly processing an initial claim with the requisite assessment, and then dealing with current claims. The latter may require subsequent self-reported reassessment (financial investments are automatically revalued). Administration tends to be cheaper than earnings-related schemes, simply because all information for eligibility and payout is gathered at a single point in time, rather than over the whole of working life.

Take-aways

We argue for, and present evidence in support of, a reorientation towards non-contributory, means-tested retirement policy structures. What might be termed an 'affluence-tested' pension has economic impacts that are welfare-enhancing and can be calibrated to comprehensively address poverty among older cohorts with diminishing earning capacity, while keeping costs sustainable in the face of an ageing demographic. It has built-in adjustment mechanisms which enhance both economic efficiency and equity as populations age, and can reach those most in need, who often fall outside more traditional contributory programmes. We posit the Australian system as a real-life example of a non-contributory, means-tested pension that works well. The Australian example is seen as a model for the Global North. But the same non-contributory, means-tested approach can be adapted to emerging economies confronting rapid population ageing, a high informal sector which contributory systems cannot cover, and deficient social protection structures.

References

Chomik, R, J Piggott, A Woodland, G Kudrna and C Kumru (2015), "Means Testing Social Security: Modelling and Policy Analysis", CEPAR working paper 2015/35.

Chomik, R, S Graham, S Yan, H Bateman and J Piggott (2018), "Retirement Income in Australia: Part II – Public Support", CEPAR Research Brief, November.

Gallup (2018), *Gallup's Perspective on The Gig Economy and Alternative Work Arrangements.*

Hayek, F (1960), *The Constitution of Liberty*, University of Chicago Press.

Katz, L and A Krueger (2016), "The Rise and Nature of Alternative Work Arrangements in the United States, 1995-2015", NBER Working Paper 22667.

Kudrna, G (2016), "Economy-wide Effects of Means-tested Pensions: The Case of Australia", *The Journal of the Economics of Ageing* 7(1): 17-29.

Kumru, C and J Piggott (2010), "Social Resilience, Means-testing, and Capital Taxation – Reflections on Economic Paradigms", in *Towards a More Resilient Society: Lessons from Economic Crises*, The Japan Institute of Economic Affairs, pp. 45-56.

Mitchell, O and J Piggott (2016), "Workplace-Linked Pensions for an Aging Demographic", in J Piggott and A Woodland (eds), *Handbook of the Economics of Population Aging*, Elsevier.

OECD (2017a), *Preventing Ageing Unequally*, OECD Publishing.

OECD (2017b), *Pensions at a Glance: OECD and G20 Indicators*, OECD Publishing.

United Nations (2017), *World Population Prospects: The 2017 Revision, Volume II: Demographic Profiles* (ST/ESA, SER.A/380), United Nations, Department of Economic and Social Affairs, Population Division.

About the authors

George Kudrna is a Senior Research Fellow at the ARC Centre of Excellence in Population Ageing Research (CEPAR), located in the University of New South Wales Business School, Australia. His research encompasses the areas of public economics and macroeconomics, specialising in applied general equilibrium models with applications to pensions, fiscal policy and population ageing. He holds a PhD in Economics from the University of Sydney, and has published on a broad range of pension-related topics, including means testing of public pensions. George is also a Fellow at the Global Labour Organization (GLO) and a Research Associate at the Centre for Applied Macroeconomic Analysis (CAMA).

John Piggott is Director of the ARC Centre of Excellence in Population Ageing Research (CEPAR) at the University of New South Wales, Australia, where he is Scientia Professor of Economics. He has published widely in retirement and pension economics and finance, and in public economics more generally. He currently serves as book review editor of the *Journal of Pension Economics and Finance,* and as an Associate Editor of the *Journal of the Economics of Ageing*. In 2018, he was awarded a Rockefeller Residency to undertake research into ageing and inequality in Asia, and in the same year was appointed co-chair of the G20 Population Ageing Taskforce.

19 Pension reform in Europe

Axel Börsch-Supan

Technical University of Munich

Pension reforms stir up great controversy and provoke often explosive and highly emotional reactions. They are known as the 'third rail' in politics in reference to the high voltage rail in underground transportation, since touching it spells trouble (Safire 2007). Pension reform attempts have caused violent demonstrations in Europe, for example in France and Greece, but pension reform has also failed in the US, where the last significant reform took place in 1983.

Nevertheless, demographic ageing in Europe and elsewhere is an unchangeable fact with severe consequences, especially for pay-as-you-go (PAYG) pension systems – more beneficiaries, fewer contributors – which have to be addressed (see the chapter by Bloom et al. in this book). In this chapter, I offer an analytical approach for policy designers. A communication strategy has to follow since opposition to reform often arises from myths, prejudices, and the lack of understanding of how demography affects our economies and social systems.

Three causes and three cures – and one additional policy target

Population ageing is driven by three root causes. The 'iron law of public policy' states that one needs at least as many policy instruments as there are policy targets, here addressing these three root causes. We will match them with the appropriate pension policies.

The first root cause is the transition from baby boom to baby bust. This transition occurred in almost all countries in the western world but at different times and with different suddenness. As a historical event, it cannot be undone and the timing of its consequences is fixed and can be well anticipated. It is a transitory problem. The traditional way to resolve transitory problems is by smoothing via saving in anticipation, then taking up loans when the financial pressure is large and repaying the loans when the pressure subsides. In terms of pensions, this means pre-funding a larger share of

pension benefits rather than financing them via pay-as-you-go. Fiscal consolidation fulfils the same purpose as pre-funding. Getting rid of debts now increases the potential to raise debt in the future when the demographic pressure will be greatest.

The second cause for demographic change is the unabated increase in longevity. While statistical offices keep projecting its end, it has not happened yet (Oeppen and Vaupel 2002). Life expectancy increases about two years every decade and is accompanied with an increase in good health, especially in Europe. We certainly do not want to change this root cause; we need to adapt to it. The policy answer is obvious but highly controversial: a society which lives longer has to work longer such that the ratio of years spent with leisure and education to years spent working remains roughly constant. Importantly, this implies not only longer working lives but also a longer time to enjoy retirement.

The third cause for demographic change is the secular decline in fertility. It is a hard problem to attack directly. One may want to fundamentally change the point of view here – if there are too few children, one at least wants to provide them with better education to keep them productive. Based on international comparisons such as the Programme for International Student Assessment (PISA), the Trends in International Mathematics and Science Study (TIMSS) and the Programme for the International Assessment of Adult Competencies (PIAAC), countries such as Germany and Switzerland do ok but are not top performers relative to, for example, the 'Asian tigers'.

In addition to these three targets, a fourth is the prevention of old-age poverty. This is particularly important because all three previously mentioned reform elements have distributional side effects. Pre-funding means saving more and consuming less, which is harder for the less well to do. Later retirement ages are hard for those in ill health, which again tend to be poorer individuals. Better education costs money as well, which has to be raised by higher taxes. In addition to the three policy instruments mentioned so far, one needs redistributional policies such as a minimum pension to safe-guard against old-age poverty.

What has been achieved in Europe?

European pension policies have been developed in different cultural, economic, and historical circumstances. Examples for the four policy instruments thus differ greatly from country to country.

To prevent old-age poverty, the introduction of a means-tested minimum pension in Germany was actually the first step of an ambitious sequence of pension reforms from

2001 to 2007. It turned out to be politically very helpful that this thorny issue was out of the way before the next reform steps – the introduction of tax-subsidised funded pensions, indexing the PAYG system, and increasing retirement age – were legislated (Börsch-Supan and Wilke 2003).

The most elegant way to address the second root cause of ageing – longevity – is to index the retirement age to life expectancy. This has been pioneered by Norway and is now being introduced, for example, in the Netherlands and parts of the French system. Note that increasing the retirement age by the same amount as life expectancy increases amounts to over-indexing. The essential point is to keep the proportions in life constant. Roughly speaking, working life lasts twice as long as life in retirement. Hence, if we were to live three years longer, then it would be perfectly fine to enjoy one more year in retirement, but this year has to be financed by two more years of working. This rule has been implemented in Germany in a long, gradual transition from 2007 through 2029.

Most European countries have responded to the other two root causes with a combination of shrinking the PAYG system and increasing funded pensions. Indexing benefits to the inverse of the system dependency ratio – i.e. the number of beneficiaries divided by number of contributors – is one way to preserve the 'defined benefit' character of a PAYG pension system at the same time as it is shrinking in order to make it sustainable. This was the idea of the 'sustainability factor' in Germany (Kommission 2003). It indexes the replacement rate with respect to the number of recipients of benefits from the pension system, divided by the number of contributors to the pension system who finance these benefits. Such an indexation system creates an automatically stabilising system which, if consistently applied, will always be solvent.

There are also successful ways to introduce both indexation mechanisms in one stroke. Good examples are the introduction of a notional defined contribution (NDC) system in Sweden and Italy after several parametric reforms failed (Palmer 2000, Holzmann and Palmer 2006, Franco and Sator 2003). An NDC system sets up an individual account to which contributions will be credited, including some form of interest. At retirement, the accumulated wealth is converted to an annuity which is then paid out to the beneficiary. The difference with a fully funded system is that the assets in the account are only notional, they are not real – in other words, they are never invested but paid to current pensioners as in a PAYG system. The notional interest rate and the annuity respond to demographic changes, reducing benefits and incentivising earlier retirement. It is interesting to observe that from a purely economic point of view, the 'sustainability factor' in Germany will create roughly the same path for future benefits and contributions as the Swedish NDC system does (Börsch-Supan 2005). Politically, however, a Swedish-style reform was unfeasible in Germany because NDC systems

closely resemble fully funded systems, which are distrusted by Germans. This is a good example why pension reform is so country-specific.

The Swiss and Dutch first pillars combine poverty prevention with the base pension for a 'normal worker' in the PAYG part of their multi-pillar pension systems and mandatory funded occupational pensions for all additional retirement income. Larger countries, such as Germany and the US, have relied more on voluntary individual account systems. These have their own problems. In Germany, they have produced a very wide range of rates of return. While some plans have very low costs, others have administrative costs in excess of 80% of life-time contributions (Gasche et al. 2013).

Why is pension reform so difficult?

Almost all of these reforms have faced political resistance (Galasso 2007, Boeri et al. 2002, Börsch-Supan 2013) and often produced time-inconsistent policy paths (Kydland and Prescott 1977, Börsch-Supan et al. 2014).

The resistance to increasing the retirement age is partially due to the misconception that health declines quickly after age 60 and that most people will not be able work in the period leading up to the later retirement ages currently under discussion. However, this is not true for the majority of the population. Health declines very slowly between the ages of 60 and 70, and the variation in health within each birth cohort is much larger than the difference in the average health from age 60 to age 70 (Avendano et al. 2005). Hence, declining health is not an obstacle to increasing the retirement age in general. However, accompanying policies are necessary to help the minority of individuals who suffer from work disability.

A second prejudice concerns productivity. Many claim that productivity decreases with age, so it does not pay to keep older workers in the company. While it is correct that physical and cognitive performance peaks at a relatively young age, experience and management and networking abilities peak much later and show no decline at the ages relevant for employment. Hence, there is no evidence that productivity declines in normal production processes, nor in services or the manufacturing industry (Göbel and Zwick 2009, Börsch-Supan and Weiss 2013).

Then there is the widespread myth that if one creates more jobs for one group of the population, there will be fewer jobs left for all other groups. This 'lump of labour fallacy' is applied to old workers, immigrants, or women taking jobs from the young, natives, or men, respectively. It may apply for single sectors where output is restricted, but is grossly false for an entire economy which can grow and create additional jobs.

Increasing the retirement age actually helps younger workers since it reduces their tax contribution burden, which would otherwise have to finance costly early retirement (Gruber and Wise 2010).

It is important to combat these myths and prejudices in order to defuse the third rail. Demography is not our destiny. Rather, it is our ability to reform our pension systems and to lay the myths and prejudices about old age to rest.

References

Avendano, M, A R Aro, and J Mackenbach (2005), "Socio-Economic Disparities in Physical Health in 10 European Countries", in A Börsch-Supan, A Brugiavini, H Jürges, J Mackenbach, J Siegrist and G Weber (eds), *Health, Ageing and Retirement in Europe - First Results form the Survey of Health, Ageing, and Retirement in Europe*, MEA.

Boeri, T, A Börsch-Supan, and G Tabellini (2002), "Would You Like to Reform the Pension System? The Opinions of European Citizens", *American Economic Review* 92: 396-401.

Börsch-Supan, A (2005), "From Traditional DB to Notional DC Systems: The Pension Reform Process in Sweden, Italy, and Germany", *Journal of the European Economic Association* 3(2-3): 458-465.

Börsch-Supan, A (2013), "Myths, Scientific Evidence and Economic Policy in an Aging World", *Journal of the Economics of Ageing* 1-2: 3-15.

Börsch-Supan, A and C B Wilke (2003), "The German Social Security System: How it Was and How it Will Be", NBER Working Paper No. 10525.

Börsch-Supan, A and M Weiss (2016), "Productivity and age: Evidence from work teams at the assembly line", *The Journal of the Economics of Ageing* 7: 30-42.

Börsch-Supan, A, K Härtl, and A Ludwig (2014), "Aging in Europe: Reforms, International Diversification, and Behavioral Reactions", *American Economic Review Papers & Proceedings* 104(5): 224-229.

Franco, D and N Sartor (2003), "Notional Defined Contribution in Italy: Unsatisfactory Present, Uncertain Future", Bank of Italy Discussion Paper.

Galasso, V (2007), *The Political Future of Social Security in Aging Societies*, MIT Press.

Gasche, M, T Bucher-Koenen, M Haupt and S Angstmann (2013), "Die Kosten der Riester-Rente im Vergleich", MEA-Discussion Paper 04-2013.

Göbel, C and T Zwick (2009), "Age and Productivity – Evidence from Linked Employer Employee Data", *De Economist* 160: 35-57.

Gruber, J and D A Wise (eds) (2010), *Social Security Programs and Retirement around the World: Youth Employment*, University of Chicago Press.

Holzmann, R and E Palmer (2006), *Pension Reform. Issues and Prospects for Non-Financial Defined Contribution (NDC) Schemes*, World Bank.

Kommission für die Nachhaltigkeit in der Finanzierung der Sozialen Sicherungssysteme (2003), Abschlußbericht, Bundesministerium für Gesundheit und Soziale Sicherheit.

Kydland, F and E Prescott (1977), "Rules rather than discretion: The inconsistency of optimal plans", *Journal of Political Economy* 85: 473-490.

Oeppen, J and J Vaupel (2002), "Enhanced: Broken Limits to Life Expectancy", *Science* 296(5570): 1029–1031.

Palmer, E (2000), "The Swedish Pension Reform Model: Framework and Issues", Social Protection Discussion Paper No. 12, World Bank.

Safire, W (2007), "On Language: Third Rail", *The New York Times*, 18 February.

About the author

Axel Börsch-Supan is the Director of the Munich Center for the Economic of Aging at the Max Planck Institute for Social Law and Social Policy in Munich and the Survey of Health, Ageing and Retirement in Europe (SHARE). He is member of the German National Academy of Sciences Leopoldina, the Berlin-Brandenburg, the Austrian Academy of Sciences, and Research Associate at the National Bureau of Economic Research (NBER), Cambridge, Mass. His policy consulting includes: Council of Advisors to the German Economics Ministry, German Pension Reform Commission, EU Commission, OECD, World Bank, and others.

20 Happiness at old ages: How to promote health and reduce the societal costs of ageing

Maddalena Ferranna
Harvard T.H. Chan School of Public Health

There exists a well-established association between health and happiness. This association reflects a strong causal link from health to happiness: healthy people have a better quality of life and report higher levels of wellbeing.[1] However, a growing body of work is also finding strong empirical support for the causal link from happiness to health: happiness protects individuals' health and enhances longevity (e.g. Chida and Steptoe 2008, Veenhoven 2008, Diener and Chang 2011, Steptoe et al. 2015). This second link suggests a new path to address one of the biggest challenges of ageing, namely, the expected increase in healthcare costs. If happiness improves health, then happiness-induced interventions have the potential to slow down health decline, reduce healthcare costs, and enhance older people's productivity and labour force participation. Happiness at old ages may reduce the socioeconomic burden of an ageing population.

## Why happiness matters for the economics of ageing: Some facts

Let us first look at some data showing the correlation between happiness and health for the ageing population. Using the 2014 US Health and Retirement Study[2], Figure 1 describes the relation between reported health and age for people older than 54 years old. The graph shows average health for people that report being happy and people that report not being happy. In this case, happiness is measured in terms of life satisfaction.

---

1   See, for instance, the results of the annual World Happiness Reports (https://worldhappiness.report/).
2   The Health and Retirement Study is a longitudinal household survey, conducted every two years, of a representative sample of the US population aged 50 years and older. Since 2006, a self-administered left-behind Psychosocial and Lifestyle Questionnaire (PLQ) has collected information about individuals' psychological wellbeing and social engagement. These data are obtained in each biennial wave from a rotating (random) 50% of the sample. For the analysis, I use data from the 2014 wave of the HRS study (7059 individuals responded to the PLQ).

Average reported health declines with age to reflect the onset of degenerative health conditions, but happy people consistently report being healthier than their unhappy counterparts.

Figure 1   Relation between reported health and age
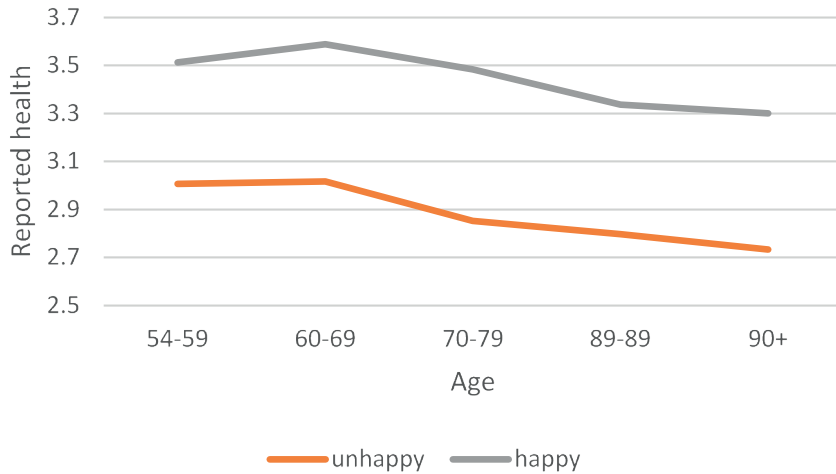
Note: Reported health ranges from 1 (poor health) to 5 (excellent health). Happiness is measured by a life-satisfaction index on a scale from 1 to 7. In the graph, I define "happy" a person that has a life-satisfaction index of at least 6. In the sample, 34% of the population satisfies this definition of "happy". For each age-category (54-59, 60-69, 70-79, 80-89,90+), I computed the average reported health among both "happy" and "unhappy" people.

Because of the positive association between health and happiness, happy old people are less of a burden on the healthcare system than unhappy old people. Moreover, happy old people are likely to have more energy and tend to contribute more to societal wellbeing, either through labour force participation or through non-market activities such as volunteering and childcare. Using the same data as before, Figure 2 displays out-of-pocket medical expenditures, hospitalisation rates and volunteering for the happy and for the unhappy people. At old ages, medical expenditures are around 30% higher for the unhappy than for the people claiming to be happy. Unhappy people are hospitalised more often than happy people. At any age, the proportion of people that volunteer is about 20% higher among happy people than among unhappy people.

Figure 2   Relation between out-of-pocket medical expenditures and age
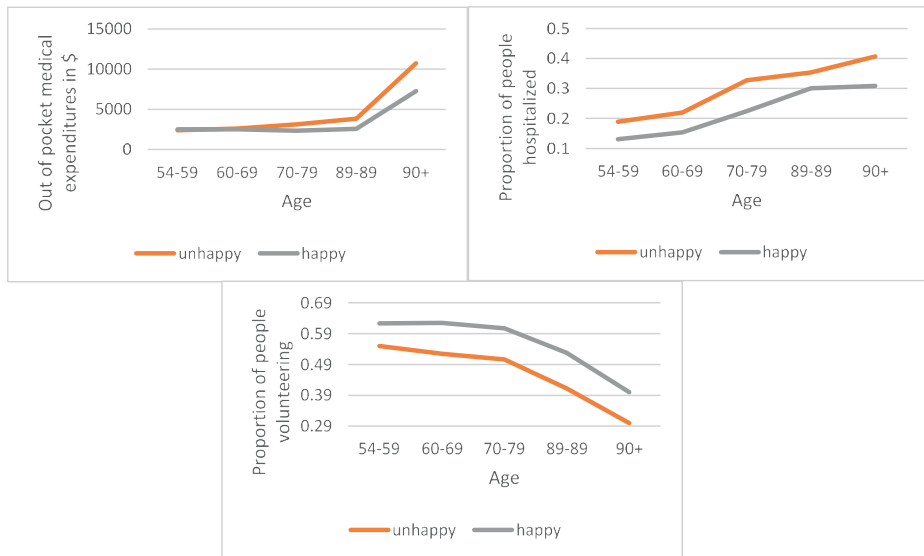
Note: For each age category (54-59, 60-69, 70-79, 80-89, 90+) and life satisfaction score ("happy"= satisfaction index ≥6; "unhappy" = satisfaction index <6), the graph on the top left shows the mean individual out-of-pocket expenditures sustained in the 2 years previous to the interview. The graph on the top right shows the proportion of people that have reported an overnight hospital stay in the two years previous to the interview. The graph on the bottom shows the proportion of people that do some volunteer work. Questions 1c and 1d of the Psychosocial and Lifestyle Questionnaire asks how often the respondent does volunteer work with children and young people or charity work. I define a person that does not volunteer as someone who answered "never" to both questions.

Suppose we introduce a policy that makes more people happy. If there is a causal link from happiness to health, what would be the effects of such an intervention? By increasing happiness, we are more likely to observe lower medical costs and medical care utilisation, and higher participation in social activities. Effectively, happy old people act as if they were younger. For instance, Figure 2 tells us that a happy 75 year-old goes to hospital as often as an unhappy 65 year-old and pays as much in medical expenses as an unhappy 65 year-old. Moreover, she/he contributes more to society through volunteering than the unhappy 65 year-old. Happiness makes people feel younger, and for this reason it can help adjust the challenges of ageing.

The determinants of happiness in the elderly

If we want to take advantage of the causal link from happiness to health to decrease the societal costs of ageing, we first need to determine what really matters for the elderly. Happiness in the elderly depends on three main factors: health, social connectedness,

and engagement in social activities.[3] Poor health often leads to depression and reduced levels of life satisfaction. Being married or partnered and having many close friends is associated to happiness, whereas experience of bereavement, loneliness, and poor social connections may lead to depression. Similarly, old people with an active social life – for example, people that volunteer or have an active role in their community and tend to spend a lot of time outside of their home – tend to report higher levels of happiness (e.g. Kahneman and Deaton 2010, Helliwell et al. 2018).

An interesting finding about happiness at old ages is that the elderly, although less healthy, seem to be happier and more satisfied with their life than middle-aged people (e.g. Blanchflower and Oswald 2008, Stone et al. 2010, Graham and Ruiz Pozuelo 2017). This is usually explained by referring to the emotional wisdom of the elderly, rather than by claiming the unimportance of health (Carstensen et al. 2003). Older people have learnt how to select more emotionally satisfying experiences and tend to have more realistic expectations and greater appreciations for their everyday life (Schwandt 2016). Note that if happiness does affect health, a selection effect may occur as well. If happy people tend to live longer, average reported happiness will necessarily be higher.

Happiness may affect health through two different paths: physiological processes and behavioral factors. Positive emotions have been found to improve immune, cardiovascular, and endocrine functioning (Steptoe et al. 2009). In contrast, negative emotions are deleterious for these processes. Moreover, positive psychological wellbeing is often linked to healthy behaviours as much as unhappiness is associated to destructive behaviours that can worsen health. Indeed, happy people are more likely to have an active lifestyle and to engage in physical activity, they usually smoke and drink less, and they tend to have a healthier diet, eating more fruits and vegetables (Huang and Humphreys 2012, Blanchflower et al. 2013, Steptoe 2019).

Promoting happiness at old ages

A wide portfolio of solutions can be designed to boost old people's happiness, and thus reduce the societal burden of ageing. Here, I review a few of these: public health investments in prevention and early detection of unhappiness; elderly centres and urban design to promote social connectedness; education policies to increase social engagement; and activities that encourage adaptation to the new circumstances characterising old age.

---

3   The struggles and uncertainties caused by low levels of material wellbeing seems to matter for happiness as well (Helliwell et al. 2019).

Primary care physicians are likely to have an important role in the life of the elderly, especially for lonely old people, who often visit the doctor to have someone to talk to. Unhappiness induces a perception of poor health, which inevitably weighs on the healthcare system. It might be useful to systematically introduce screening protocols to detect patients' unhappiness and well-defined methods for supporting positive psychological wellbeing, such as counselling and follow-up visits by nurses or social workers.[4] More generally, larger investments in preventing both physical and psychological distress will improve public health and reduce later treatment costs.

Positive psychological wellbeing is strongly related to fulfilling social relationships. The creation of a network of elderly centres, for example, would allow old people to meet with their peers, engage in social activities, and have stimulating experiences. To be effective, these centres must be easily reachable (i.e. they must be located close to where the elderly lives or they must provide transportation services). In addition, they must be affordable, since people with few resources and few alternative social opportunities are more likely to benefit from the presence of the centres.

Another way to increase social connectedness is through urban design. City beautification projects will improve the 'livability' of the social environment and induce old people to leave their homes and 'occupy the streets', thus increasing their probability of meeting other people and establishing new social ties. The creation of pedestrian areas, for instance, would favour those goals. These types of intervention will be more effective if they simultaneously tackle economic and social inequalities by redirecting investments into marginalised neighbourhoods.

Old age also creates new opportunities. Once retired, people have the time to discover and pursue new passions (or old passions that have been neglected) and can be a productive resource for the entire society. Policies that help this process should be welcomed. Increasing the number of universities for the elderly is one example. Education is a good way to improve old people's memory and to fight loneliness, thereby reducing mortality and morbidity risks. Moreover, people may find a new career path that is more suitable to their age, and thus keep contributing to the community despite their age. Tutoring young generations is another example – their accumulated knowledge and life experiences make old people a resource for the community.

Activities that promote and encourage adaptation to old age could also increase happiness and improve health. For instance, practicing yoga comes with many benefits for both physical and mental health, such as an increase in flexibility, reduced joint pain, and reduced stress. In particular, yoga has been found to improve quality of life and energy and reduce fatigue among the elderly.

---

4   See, for example, https://well.blogs.nytimes.com/2016/03/03/why-doctors-care-about-happiness/

Conclusion

The causal link from happiness to health suggests that we can help address the challenges of ageing by focusing on the quality of life of the elderly. Happy old people tend to be more productive and require less medical attention than unhappy old people. For the sake of the argument, it does not matter if happiness affects actual health or only perceived health. People who feel unhealthy go to the doctor, use healthcare resources, and are less productive, independently of whether they are truly unhealthy. Even if happiness only has a placebo effect, a careful consideration of what really matters for the elderly will have broader benefits for the entire society.

References

Blanchflower, D G and A J Oswald (2008), "Is Well-Being U-shaped over the Life Cycle?" *Social Science and Medicine* 66(8): 1733–49.

Blanchflower, D G, A J Oswald and S Stewart-Brown (2013), "Is Psychological Well-Being Linked to the Consumption of Fruit and Vegetables?", *Social Indicators Research* 114(3):785-801.

Carstensen, L L, H H Fung and S T Charles (2003), "Socioemotional Selectivity Theory and the Regulation of Emotion in the Second Half of Life", *Motivation and Emotion* 27(2): 103–23.

Chida, Y and A Steptoe (2008), "Positive Psychological Well-Being and Mortality: a Quantitative Review of Prospective Observational Studies", *Psychosomatic Medicine* 70(7): 741–56.

Diener, E and M Y Chang (2011), "Happy People Live Longer: Subjective Well-Being Contributes to Health and Longevity", *Journal of Applied Psychology* 3(1): 1–43.

Graham, C and J R Pozuelo (2017), "Happiness, Stress, and Age: How the U Curve Varies across People and Places", *Journal of Population Economics* 30(1): 225–64.

Helliwell, J F, M B Norton, H Huang and S Wang (2018), "Happiness at Different Ages: the Social Context Matters", NBER Working Paper 25121.

Helliwell, J, R Layard, and J Sachs (2019), *World Happiness Report 2019*, Sustainable Development Solutions Network.

Huang, H and B R Humphreys (2012), "Sports Participation and Happiness: Evidence from US Microdata", *Journal of Economic Psychology* 33(4): 776-93.

Kahneman, D and A Deaton (2010), "High Income Improves Evaluation of Life but not Emotional Well-Being", *PNAS* 107(38): 16489–93.

Schwandt, H (2016), "Unmet Aspirations as an Explanation for the Age U-shape in Wellbeing", *Journal of Economic Behavior & Organization* 122: 75–87.

Steptoe, A, S Dockray and J Wardle (2009), "Positive Affect and Psychobiological Processes Relevant to Health", *Journal of Personality* 77(6): 1747-76.

Steptoe, A, A Deaton and A A Stone (2015), "Psychological Well-Being, Health and Aging", *The Lancet* 385(9968): 640–648.

Steptoe, A (2019), "Happiness and Health", *Annual Review of Public Health* 40: 339-59.

Stone, A A, J E Schwartz, J E Broderick and A Deaton (2010), "A Snapshot of the Age Distribution of Psychological Well-Being in the United States", *PNAS* 107(22): 9985–90.

Veenhoven, R (2008), "Healthy Happiness: Effects of Happiness on Physical Health and the Consequences for Preventive Health Care", *Journal of Happiness Studies* 9(3): 449-69.

About the author

Maddalena Ferranna is a Research Associate at the Harvard T.H. Chan School of Public Health. Her research concerns the development and application of methods to evaluate public policies, with a special focus on distributional issues and well-being measurement. Topics include climate change interventions, the broad socio-economic value of vaccines, and the relation between health and well-being.

Globally speaking, population ageing - driven by three principal forces: declining fertility, increasing longevity, and the progression of large-sized cohorts to older ages - is the dominant demographic trend of the 21st century. Never before have such large numbers of people reached the older ages.

The most explosive growth in the numbers of older people will occur among countries that are currently classified as middle-income, but the issue is one that will have global reach and consequences and is already setting off alarm bells among politicians and policymakers across the world.

Economists are also expressing concerns, and this eBook examines the myriad challenges and economic uncertainties that ageing populations pose to areas such as healthcare, pensions and workforce demographics.

Although the challenges faced are indeed formidable, the chapters herein suggest they are not insurmountable, and this book brings attention to a number of options available to address them. These range from institutional adaptations and policy reforms related to health and long-term care and its finance, to new technologies and designs.

The impending challenge is to figure out which are best to adopt, individually and collectively, and to mobilize the political and social will and the financial muscle to act proactively. Indeed, as a chapter in this book pointedly argues, investing in happiness at old ages may improve health and longevity, thereby reducing the socioeconomic burden of ageing populations.