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A tight labour market – the most feared consequence of depopulation – may be among its greatest blessings

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Abstract

Concern for the economic implications of aging and contracting populations have become a dominant feature of population-related policies in low-fertility countries. The overriding concern is for a shrinkage in workforce. Many analyses have modelled future workforce assuming that age-specific workforce participation rates remain the same in scenarios that differ in their population growth rate and extent of aging. They do not allow for the natural feedbacks in a tightening labour market, which might cause greater recruitment, retention and redeployment of workers, reducing unemployment and underemployment and facilitating participation of marginalised groups including people with disabilities. Since a number of OECD countries have passed the high-point of working-age proportion decades ago, the hypothesis of diminishing workforce can now be tested against their actual experiences. Among OECD countries, no correlation was found between extent of demographic aging and proportion of people employed, nor hours worked per capita. Nor do aging populations appear to suffer any productivity penalty. In contrast, the proportion of underutilised youth and the extent of income inequality was lowest where working-age population was contracting. Comparing naturally declining with immigration-boosted population projections, we find that extra costs of aging are off-set by reduced costs associated with infrastructure expansion and education. Trends in health and disability of older cohorts suggest that costs might increase less than proportionally with their share of population, while costs associated with maintaining population growth tend to escalate with population density. Unwarranted concerns about demographic aging should not overshadow the social and environmental benefits of depopulation.

Key words: demographic aging, depopulation, workforce participation, labour market, productivity

Introduction

Concern for the economic implications of demographic aging have become a dominant feature of economic forecasting, leading to recommendations that governments act to increase birth rates and immigration to dilute older cohorts with more young adults (McDonald and Temple, 2010; Parr and Guest, 2014; Bricker and Ibbitson, 2019; Vollset et al., 2020). Although prospects for health care and pension funding receive much attention, a dominant policy concern is that the economy will be constrained by a shortage of workers (Bloom et al., 2015).

At least three hypotheses might be offered for the effect of aging on the workforce. The first holds that the workforce is governed by the supply of workers, such that a decline in the proportion of people of working age will reduce employment and production, leading to lower GDP per capita and larger intergenerational transfers. This hypothesis regards workforce participation and productivity of work to be governed by individual characteristics, including age and level of education, which are unaffected by labour demand (McDonald and Temple, 2010; Parr and Guest, 2014; European Commission, 2014; Clements et al., 2015; Marios et al., 2019). It has also been argued that an older workforce will have lower productivity growth due to loss of cognition, agility and/or currency of knowledge (Skirbekk, 2007).

A second hypothesis postulates that the workforce is governed entirely by employer demand, such that a fall in working-age proportion will be compensated by an increase in workforce participation. A more nuanced treatment would consider the impacts of aging on labour demand. For example, older cohorts might spend less overall but consume more labour-intensive services relative to import-intensive goods. A third hypothesis allows for market forces to adjust both supply and demand through pricing of labour: aging leads to a tighter labour market which increases wages and the price of some goods and services, leading to a drop in demand. Hence some rise in age-specific workforce participation would be expected, while workforce as a proportion of population would fall to a smaller extent than the fall in proportion of working-age people. Due to wage increases, incomes would be less unequal, while labour productivity would rise as the least productive jobs are shed and businesses invest in training and labour-saving technologies. Under either the second or third hypothesis, in an older population the average person would spend more of their adult life in work, enjoying greater economic security and saving for retirement. Average lifetime labour earnings would be greater, even if GDP per capita were unchanged due to the compositional bias of a larger share of retirees.

The first hypothesis seems least consistent with economic theory. Yet it is implicit throughout the extensive literature and commentary on economic impacts of aging. Frequently, the word "workforce" is used in place of "proportion of people of working-age", as in the erroneous statement, "Workforces in some 40 countries are already shrinking because of demographic change" (The Economist, 2019). Marios et al. (2020) (uniquely, in our experience) acknowledges that they consider only supply-side changes, noting "this is consistent with the general view that demographic models capture the changes in human capital as the supply side of labor and do not attempt to model the demand for labor and labor market itself, which belongs to the realm of economic modeling." But economists do not seem to have taken up this challenge. If anything, they apply supply-side assumptions with less nuance with respect to education or socioeconomic status, often simply assuming age-specific workforce participation rates remain constant (e.g. Clements et al., 2015).

The assumption that supply of job-seekers determines the workforce is inherent in the concept of old-age dependency ratio, or its reciprocal, the support ratio (the ratio of people of 'working age' to those older, with working age typically defined as 15-64 years but often 20-64 or utilising a nationally specific retirement age). To use 'working age population' as a surrogate for 'workforce' assumes a constancy in the labour market that aging itself breaches. Although dependency ratios are widely discredited by academic demographers as measuring neither those in paid work nor those who are dependent (Spijker and MacInnes, 2013; Sanderson and Sherbov, 2015), they are widely used to model the economic impacts of aging

(e.g. Parr et al., 2016) and have been the stimulus for considerable pre-emptive social engineering. Pro-natalist policies have boosted fertility rates (Myrskyla et al. 2009, Luci-Greulich and Thévenon, 2013). They usually comprise costly expenditure on families, but some countries have withdrawn access to contraception and reproductive health services, undermining women's rights (Currie, 2021; United Nations Human Rights Commissioner, 2021). Many countries have already scheduled increases in pension eligibility age to encourage workers to defer retirement (OECD, 2019) despite the regressive nature of these changes due to socioeconomic differences in longevity gains (Gratton and Scott, 2016; Adair and Lopez, 2020; Sánchez-Romero et al., 2020). Elevated immigration levels have been called for or justified as a means of mitigating old-age dependency (e.g. McDonald and Temple, 2010; Parr and Guest, 2014; Vollset et al., 2020; Commonwealth of Australia, 2015), despite many studies concluding that the impact of elevated immigration on age structure is small and ephemeral, in comparison with a large and durable impact on population size (Productivity Commission, 2016; Götmark et al., 2018). For example, Australia's Productivity Commission (2011, p 10) found that "to maintain the age structure of 2003-04 in 2044-45, annual migration during that period would need to be above 3 per cent of population, leading to a [quadrupling of the population] by the middle of this century."

This study asks which hypothesis best reflects the actual experience of OECD countries as they have aged. OECD countries vary relatively widely in their extent of aging to date, providing a natural experiment. We then explore how much further aging is likely to progress before age profiles stabilise, and address whether these profiles are likely to constrain the supply of labour to an extent that would lower societal prosperity. Finally, using Australia as a case study, we compare the fiscal burdens of demographic aging with the costs of the population growth needed to moderate aging.

Methods

OECD data were used to test the hypotheses that demographic aging reduces the size of the workforce or its productivity. Parameters used included workforce participation (civilian employment as percent of population of all ages), hours worked per worker, GDP per hour worked (USD, constant prices, 2015 PPP), population aged 15-64 as percent of population, and population aged 65 and over as percent of population. Workforce participation rates of people aged 15-64 and those aged 65 and over were obtained from the International Labour Organisation (ILO). Proportion of employed people in total population and hours worked per head of total population were calculated and regressed against proportion aged 15-64 years and proportion aged 65 and over, using data from 2018 (the most recent year with full coverage of OECD countries). Data on income inequality were obtained from the World Bank.

For those countries which have experienced an appreciable decline in 'working-age' proportion (15-64 years) since its peak, longitudinal analyses of the course of employment participation and labour productivity were used to detect any change in course as working age proportion increased and then decreased. These countries included Japan, Czechia, Finland, Slovenia, Italy, Germany, Latvia, Greece, Estonia and the Netherlands. Among these countries, the decline in working age proportion experienced by 2018 ranged from 4% to 10% of total population (approximately 6% – 15% decline as percentage of the peak working age proportion).

To compare productivity gains among countries differing in extent of aging, OECD countries were grouped according to the extent of decline in working-age proportion since its peak. Since productivity growth rate (as a percentage) tends to be greater in transitional countries which are starting from a low base, Eastern European émigré countries (Czechia, Estonia, Hungary, Latvia, Lithuania, Poland, Slovakia, Slovenia) and southern late-transition countries (Chile, Mexico, Turkey) were separately grouped. South Korea was separated as an exceptional case, having achieved a very rapid fertility transition and consequently a high and compressed peak in working-age proportion, but not yet experiencing much decline in that proportion.

To compare the fiscal implications for future scenarios exhibiting different rates of population growth and extent of aging, Australia's population was projected using Spectrum DemProj version 4 software. Demproj is a single-year cohort model, incorporating age-specific fertility, mortality and migration, populated with data from United Nations 2015 World Population Prospects (UNDESA, 2015). These projections assumed a constant total fertility rate (TFR) of 1.8, and life expectancy rising to 85.6 (male) and 88.9 (female) by 2050, then remaining constant. Scenarios differed in level of net immigration, ranging from zero to two percent of population annually. Setting immigration constant as a percentage of resident population, rather than at a numerical level, achieved near-constant growth rates and equilibrated age distributions in the latter part of the century. Fiscal costs of pensions, aged care, health and education expenditure were calculated based on continuation of current age-specific costs (Parliamentary Budget Office, 2019; Grundoff, 2020; Dyer et al., 2020). Infrastructure costs were projected based on public infrastructure expenditure of 1.68% of GDP per 1% per annum population growth rate (O'Sullivan, 2014)

Results

Historical experience of aging and the workforce

Across OECD countries in 2018, there was no significant trend relating extent of demographic aging with proportion of people in paid employment, nor with hours worked (Figure 1). This was true whether aging is expressed as proportion of people 65 years and over, or as proportion of people aged 15-64 (a different ranking, since some OECD countries still have relatively high youth dependency, such as Turkey and Mexico). In each case, the regression accounts for a very small proportion of the variation among countries (as indicated by the R^2 value) and the slope of the regression is not significantly different to zero ($P>0.05$).

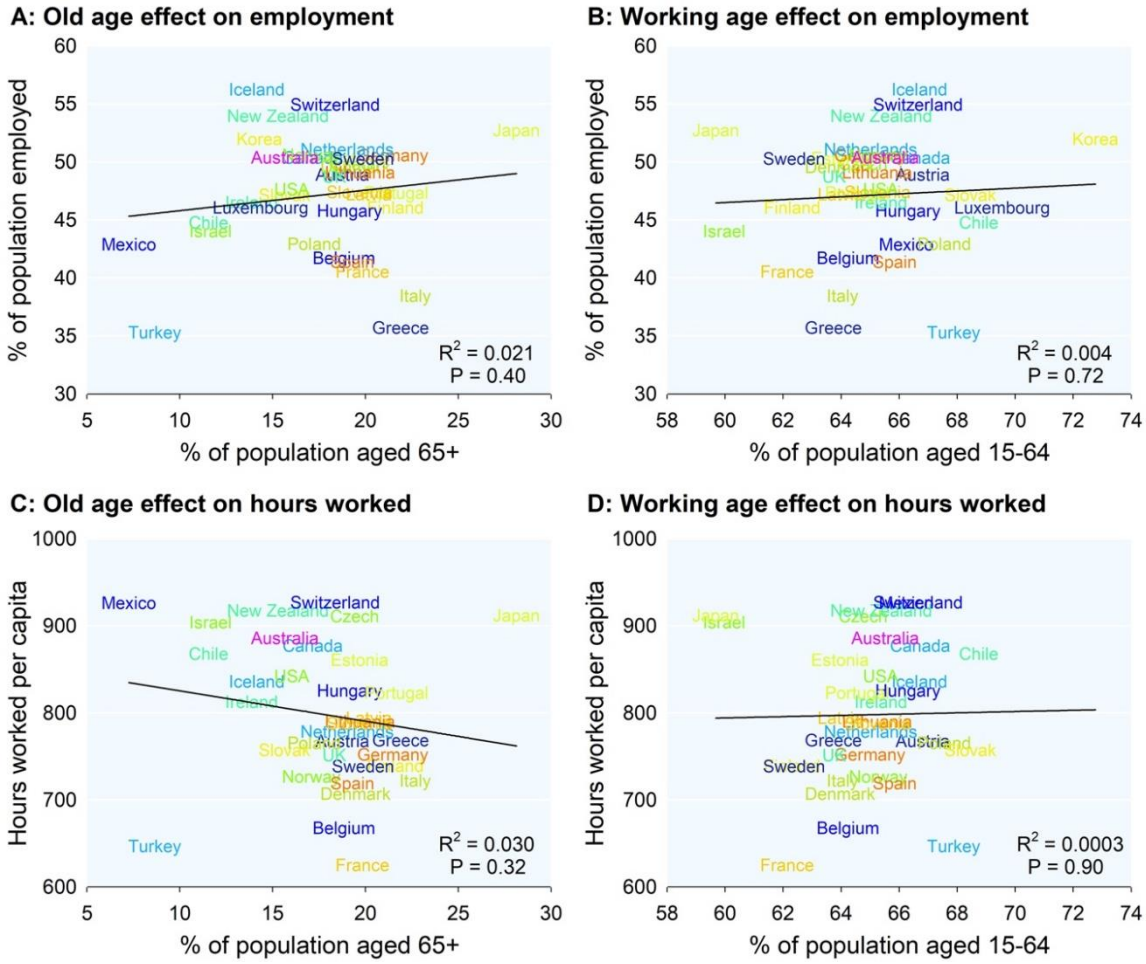

Figure 1: The relationship between the proportion of people employed and proportion of (A) "older" people or (B) of "working age" people, and alternatively the hours worked each year per head of total population correlated against (C) "older" people and (D) "working age" population. Year 2018 data from OECD. Colours are varied merely to improve legibility.

There are far greater differences resulting from other factors such as economic circumstances and cultural values: some cultures discourage married women from working, and some would rather respond to productivity improvement by working less than by earning more. The rapidity of aging, often cited as a cause for concern, has also been shown to have no negative effect on economic growth rate (Acemoglu and Restrepo 2017).

In those countries which have already seen significant decline in working-age proportion, longitudinal data show no apparent influence on the amount of work being done, nor the productivity of that work (Figure 2).

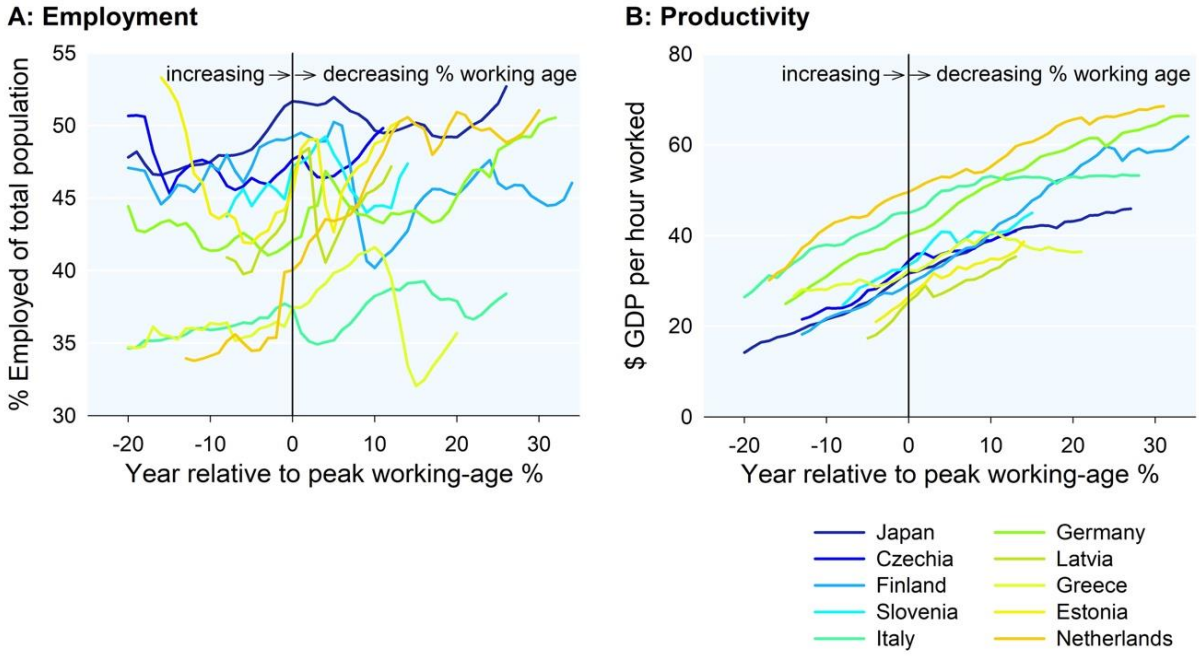

Figure 2. The change across time leading up to, and after, the year of maximum proportion of people aged 15-64 (nominally "working age"), in (A) the prevalence of employment, and (B) productivity of labour, in the 10 OECD countries which have seen the greatest decline in proportion of "working-age" people. Data from OECD.

Comparing productivity growth since 2009, high-income countries experiencing the greatest decline in working-age proportion fared better on average than those with little or no decline, although the difference was not significant (Figure 3.) Similarly, the rapidly aging Eastern European countries performed at least as well as the more youthful late-transition countries, but not significantly better. As expected, productivity growth rate was significantly higher in these middle-income countries compared with the high-income groups, but in absolute terms (additional dollars per hour worked) the difference was insignificant.

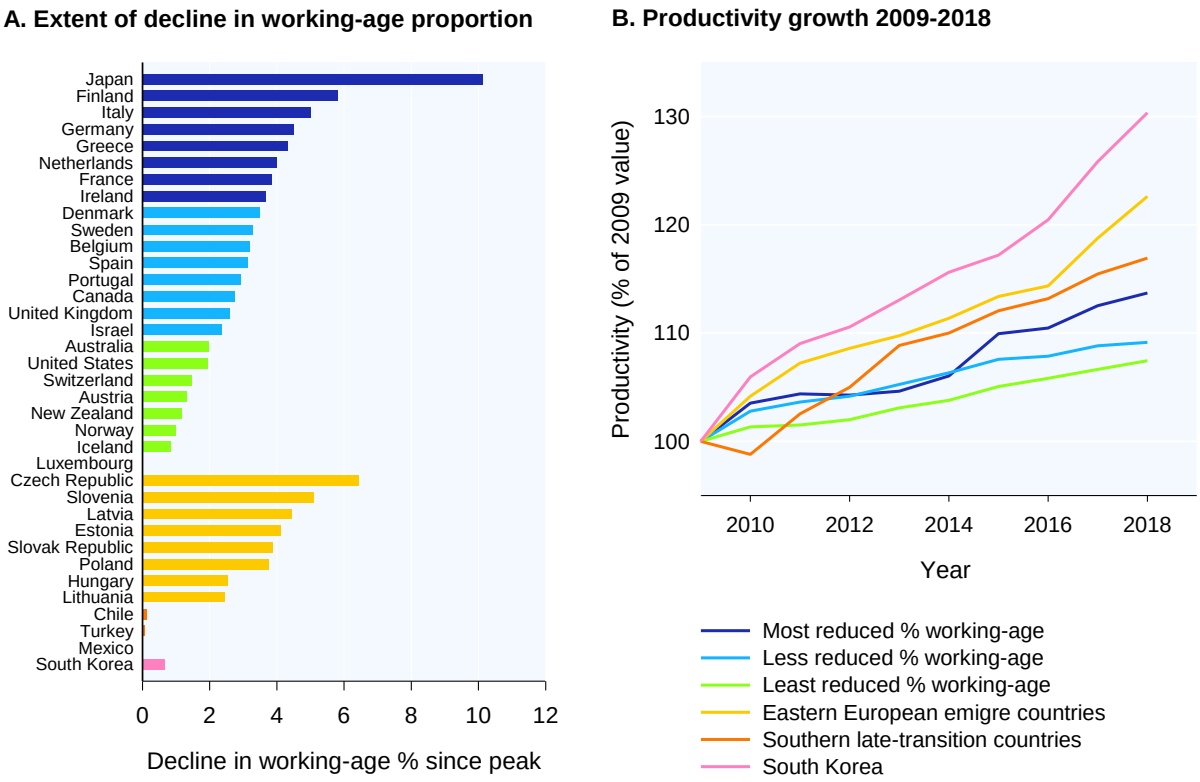

Figure 3. A: the extent of decline in working-age proportion (those aged 15-64 years as percentage of total population) since its highest value, for each OECD country. Colours correspond to groupings in B: the change in productivity (GDP per hour worked) from 2009 to 2018.

Decomposing working and non-working populations by age and full-time or part-time status similarly shows no trend in size of the workforce from the oldest to mid-transition countries (Figure 4). The few OECD countries that still have a large proportion of children (Mexico, Turkey and Israel) do have a smaller proportion of workers, but such a trend is not evident as the proportion of older people rises.

The workforce is made up of full-time and part-time workers, both under and over the age of 65. Workforce participation of people over 65 has been increasing in many countries in recent years, and is above 20% in Chile, Korea, Japan, Mexico and New Zealand. While over-65s remain a relatively small proportion of the total workforce, retirement deferrals nevertheless lessen the growth in retirees. The Eastern European countries tend to have low proportions of part-time employment and also low participation of people over 65. It is likely that greater acceptance of part-time and flexible work arrangements will encourage older workers to defer retirement. New Zealand offers the same publicly funded pension (NZ Super) to all people over 65, regardless of other sources of income. Their high workforce participation suggests that a retirement-triggered or means-tested pension can be a disincentive for lower-income people to stay in the workforce (Grundoff, 2020).

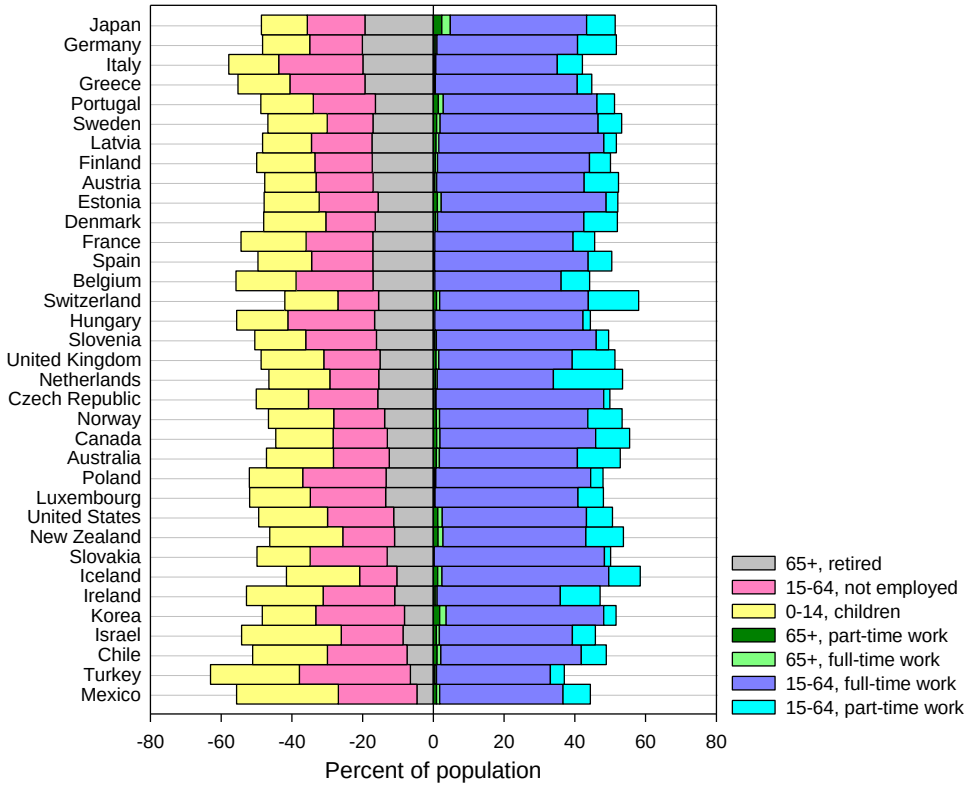

Figure 4. Proportions of dependent and employed persons by age category, for OECD countries. Countries are displayed in order of aging, from smallest to greatest proportion aged 65 and above. Employed persons are to the right of the abscissa (positive values), dependent persons to the left (negative values). Full-time is defined as those doing 30 or more hours per week. Data from OECD and ILO.

However, proportions of working-age people outside the workforce, and those under-employed (working part time and wanting more hours) constitute larger sources of variation among countries, and a larger capacity to buffer demographic change (Figure 4). The stability of employment we have seen in aging countries suggests that there is sufficient potential labour supply to respond to a tightening labour market. Early retirement is a significant contributor to non-participation, and it is among the 55-65 age group that retirement deferral has been most evident in the past two decades (Coile et al., 2018). Among younger adults, there are many reasons for their non-participation in the workforce. Extended duration of education has particularly reduced full-time employment of youth, but the reverse influence is also present: the difficulty young adults experience in finding appropriate work can induce them to take on further training.

Figure 5 offers further evidence that employment is limited by demand for employees more than supply of job-seekers. Figure 5A indicates that young people seeking to enter the workforce find it significantly harder where the working-age population is growing more rapidly, and easier where it is contracting. Figure 5B shows the income share of the poorest quintile of households was negatively correlated with growth in the working-age population. Labour market theory anticipates that labour oversupply suppresses low-wage incomes and boosts returns to capital (Rowthorn 2015) and here we have evidence of this effect. Inequality is correlated with a wide range of social ills from mental health to crime rates, and has a greater effect than per capita wealth on self-reported wellbeing (Wilkinson and Pickett 2009).

Over the decade prior to the COVID-19 pandemic, Australia's youth underemployment rate was extraordinarily high by developed-country standards, more than twice the average for G7 countries, and was unusual within the OECD in having risen substantially since the end of the Global Financial Crisis (Lloyd-Cape, 2020). This decade was characterised by sustained rapid population growth (1.5-1.7% per annum) due to elevated immigration.

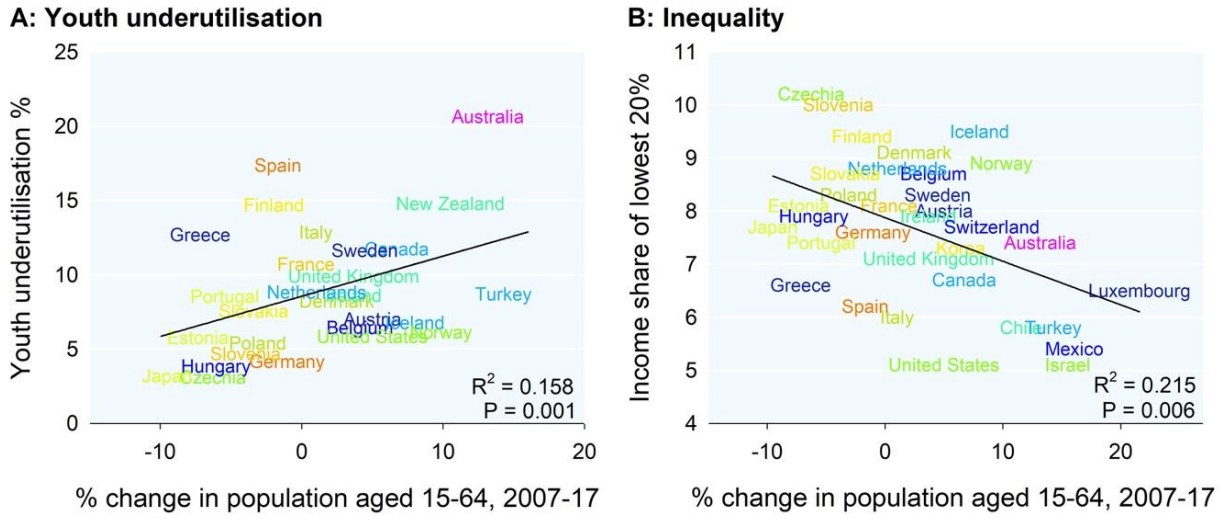

Figure 5. The effect of growth or contraction of the "working-age" population over the previous decade on A: Underutilisation (the sum of unemployment and underemployment) of people aged 15-24 years, in 2017, and B: Income share of the poorest 20% of households, as an indicator of inequality. Data from OECD and World Bank.

Models also tend to assume that supply rather than demand governs the relationship between skills attainment and projected national income or productivity (e.g. European Commission, 2014; Marios et al., 2019, 2020; Lutz and Gailey, 2020). They omit the possibility for an increase in proportion of highly qualified people to result in more people being overqualified for the work that they do, and competing with lower-skilled workers. Figure 6 presents the education attainment and employment categories of Australians aged 30-39, as reported in censuses at decade intervals. While the proportion of higher-skilled jobs has increased, as would be expected from technological change and the shift from manufacturing to service sectors, it has not increased in proportion to the up-skilling of the population. Australia's Productivity Commission (2020) found that Australians who graduated after the Global Financial Crisis (the cohort coming after those in Figure 6) have fared even more badly, finding lower quality jobs and experiencing slower career progression than earlier graduates.

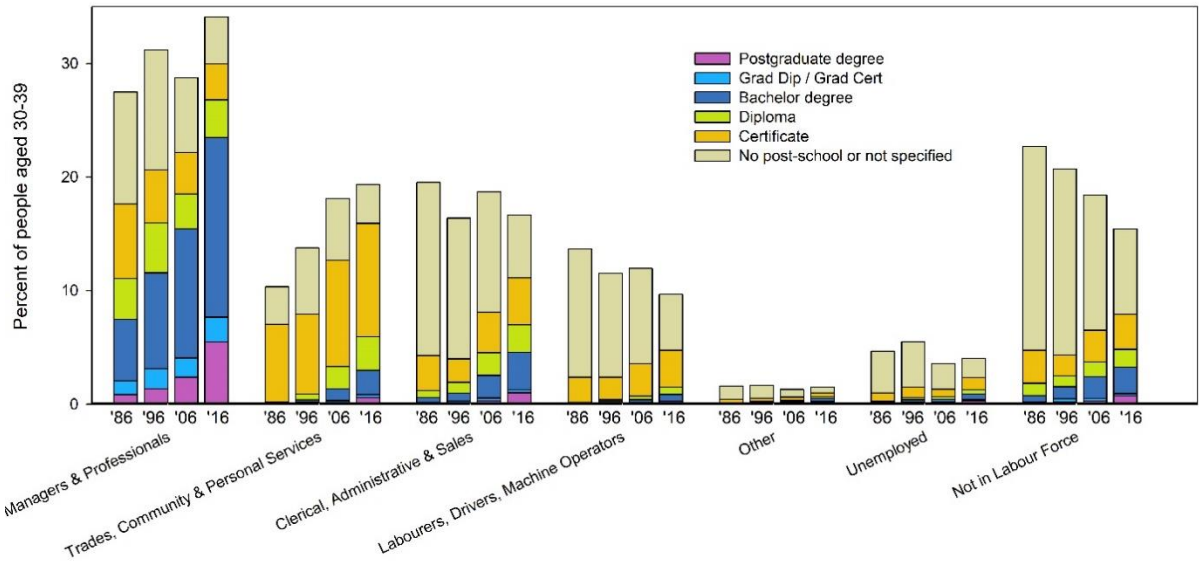

Figure 6. Australian residents aged 30-39 years, by employment and educational attainment. Source: Australian census CURF data, 1986, 1996, 2006 and 2016 censuses.

Projecting future impacts of aging

What does the experience of nations to date tell us about the likely impacts of aging in the future? No country has yet completed the demographic transition to the point of having a near-stable age profile. In most plausible scenarios, including quite optimistic increases in longevity assumed in the UN medium-fertility projection, the proportion of people in the 15-65 age range remains above 50% (Table 1). If population contraction in developed countries is moderated by some immigration (mostly of young adults), the working age proportion could be somewhat higher. But even sustaining rapid population growth through immigration would raise the working age proportion only a few percent, equivalent to raising retirement age by two to four years (In Table 1, compare scenario 2 with scenarios 3–5). Even Japan, projected by the UN to contract at up to 0.65% p.a., as well as achieving world-leading life expectancy of 93 years, would settle at around 51% aged 15-64 and 35% over 65 (Scenario 5).

Table 1. The age distribution associated with current and possible future population scenarios.

	Assumptions				Age distribution			
Scenario	***TFR****	***Life expect -ancy***	***NOM** per 1000***	***Pop growth % p.a.***	**Aged 0–15 %**	**Aged 15–64 %**	**Aged 65+ %**	***Source***
1. Australia in 2019	*1.74*	*82.8*	*9*	*1.6*	19	65	16	*Australian Bureau of Statistics*
2. Australia in 2100, high population growth	*1.85*	*92.7*	*4*	*0.8*	15	56	29	*Productivity Commission (2013, p54)*
3. Stable, stationary population with replacement fertility	*2.08*	*92.7*	*0*	*0*	16	54	30	*Modelled from UN(2019) life tables for Japan 2085-90.*
4. Stable, stationary population with low fertility + migration	*1.56*	*92.7*	*2.5*	*0*	13	55	32	*Modelled from UN(2019) life tables for Japan 2085-90.*
5. Low fertility, gradually declining population	*1.78*	*92.7*	*0.5*	*-0.4*	13	51	35	*UN (2019) medium projection for Japan 2085-90*
6. Very low fertility, rapidly declining population	*1.41*	*92.7*	*0.5*	*-0.9*	10	49	41	*UN (2019) constant fertility projection for Japan 2085-90*

*TFR = total fertility rate, the number of children the average woman has in her lifetime.
**NOM = net migration, the number of long-term arrivals minus long-term departures, per year per 1000 of the resident population.

The UN's medium fertility projection assumes Japan's fertility will rebound to around 1.78 children per woman. Under a constant fertility projection, which might be considered an aging "worst case scenario", Japan's TFR remains at 1.4, population contraction would be approaching 1% per annum, and the proportion aged 15-64 would decline to 49% (Senario 6 in Table 1). In this scenario, even if workforce participation of older citizens does not increase beyond its current 20%, adding 20% of those aged over 65 would raise the pool of potential workers to 57% of population, requiring a participation rate of 79% of working-age people to match the current OECD average of 47% of population employed.

It should not be assumed that such a high proportion of workers is needed for wellbeing. In current societies, many jobs exist to provide income to the worker, and to advantage one provider of similar goods or services over another, without adding significantly to the goods and services consumers enjoy. These jobs could be shed without lowering standards of living. The shifting demographics will likely increase demand in health and aged care, but demand in some sectors would be reduced, such as for construction, education, law enforcement and correctional services. Technological changes will also continue to reduce the labour input required for equivalent service delivery.

The fiscal implications of aging similarly exhibit trade-offs. Aging is commonly portrayed as a formidable challenge, if not a crisis, for government finances (Preston, 2014; Bricker and Ibbitson, 2019). Population growth rate and age profile are linked, so the savings that might be achieved by lessening aging should be measured against the cost of the extra population growth required to achieve the change in age profile. Due to the delay in establishing a stable age structure after population stops growing or enters decline, this trade-off might not be obvious. To illustrate the trade-off we contrast long-range projections that establish stable growth rates and age structures.

Figure 7 compares the fiscal outcome for five projections of the Australian population that achieve approximately steady population growth rate and age composition by setting immigration levels as a constant percent of population. (Raising birth rates would yield similar results, but with higher education costs and lower working-age percentage for the same growth rate.) No exponential growth rate can be sustained indefinitely, as might be apparent from Figure 7A, so these scenarios are illustrative only, used to circumvent the lag in stabilisation of age structure. Figure 7B shows that if the population grew at 2% per year (projection E), Australia could maintain approximately its current proportions of children, 15-64-year-olds and over-65s (until overpopulation forces a catastrophic end to growth). But, as Figure 7C shows, the costs of infrastructure and education to support this growth outweigh any benefit from lowering the costs related to elderly citizens. On the other hand, if there was a stationary or declining population, then there would be a higher proportion of older citizens, but the savings on infrastructure and education would pay for the increase in pensions, health care and old-age care.

These projections assume that old-age related costs increase in proportion to the share of population over 65 and that infrastructure costs are proportional to population growth rate. There is increasing evidence that population density escalates infrastructure costs, with the need for underground trains, high-rise schools, desalination plants and waste disposal issues, among other challenges (van Onselen et al., 2019). Hence, Figure 7 might underestimate these costs. In contrast, the increase in health and aged care needs might be less than proportional to the increase in over-65 population due to improvements in health (Zweifel et al., 2004; Sanderson and Sherbov, 2010). These considerations increase the benefits of an older, stationary or declining population over a younger, growing one.

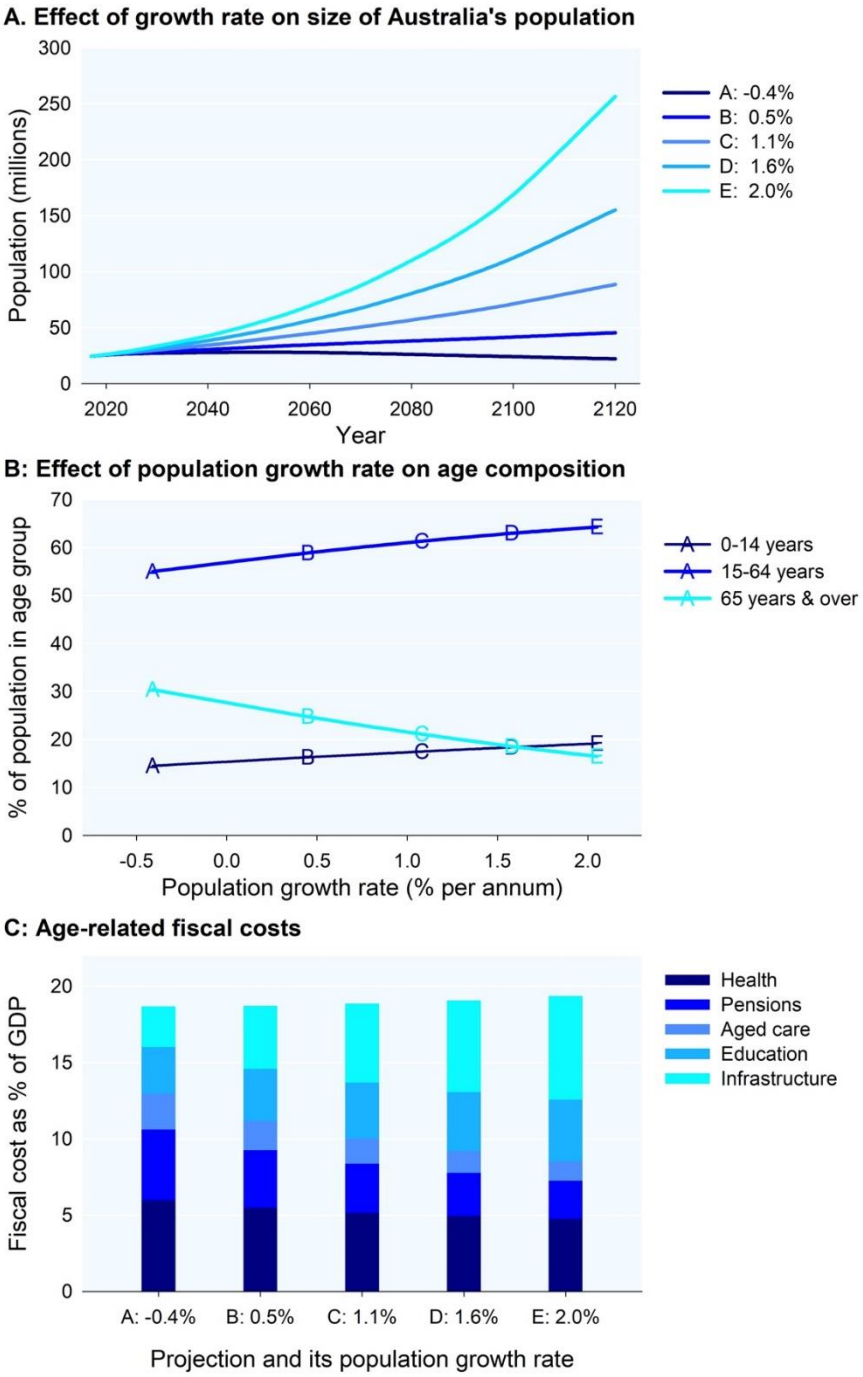

Figure 7. Characteristics of five projections which vary immigration to achieve roughly constant population growth rate and age distribution. A: The size of Australia's population under each projection. B: The effect of the population growth rate on proportions of children, nominally "working age" people and people aged 65+. C: Fiscal costs associated with the stable age structure established by each growth rate, assuming that age-specific costs remain similar to today.

By including infrastructure costs, it is revealed that the economic costs of population growth can outweigh those of aging (O'Sullivan, 2012). Lee and Mason (2014) examined the National Transfer Accounts of 40 countries and also found slightly negative population growth rates "maximise per capita consumption when the cost of providing capital for a growing labour force is taken into account." This was true across 17 high-income countries, despite most of them offering much more generous pensions than the Australian example in

Figure 7. Lee and Mason (2014) describe this effect of demographic aging on human and physical capital as the "second demographic dividend," referencing the now widely acknowledged "demographic dividend" which is claimed to boost economic growth when lower birth rates reduce the burden of dependent children (Bloom et al., 2001). According to their analysis, this second demographic dividend is larger and more durable than the first (Mason et al., 2016).

Discussion

The hypothesis that the size of the workforce is governed by the size of working-age cohorts is not supported by the experience of OECD countries to date. Without evidence of shrinking workforces, we must consider the likelihood that labour demand influences workforce participation. A demand-responsive workforce invalidates the all-too-common analyses that model future economic performance solely based on supply of human capital.

How do we judge change to be positive or negative?

Considering the projected future extent of aging, we have found no convincing evidence that demographic aging will constrain the workforce, overburden government finances or limit standards of living. Indeed, it seems more likely to enrich the average person, as a tighter labour market is expected to increase the wages share of GDP and reduce underutilisation of labour, lowering inequality.

Whether or not aging contributes to growth or contraction of GDP per capita is a separate issue to consider. Comparing two countries or time periods with different age profiles raises the problem of compositional bias. If both countries have identical age-specific workforce participation, income and consumption patterns, the wealth of people over their life course would be the same, but GDP per capita would be higher in the younger society because the population contains a higher proportion of people in their peak earning years. Thus compositional bias leads to the mistaken impression that the younger society is richer.

As we have seen, age-specific workforce participation is not likely to remain the same as aging progresses. We can expect greater recruitment, retention and redeployment of workers as the labour market tightens. Equilibrium theory would suggest that the consequent rise in wages will marginally reduce labour demand, perhaps in favour of increased automation, raising overall labour productivity (Acemoglu and Restrepo, 2017). Hence, some decline in hours worked per head of population would occur, even though the average person is in paid work for more hours of their life. Hence, even if employment were to shrink as a result of aging, this could represent an increase in productivity, age-specific income and societal wellbeing as the least productive, least necessary and least rewarding jobs are shed, and the remaining jobs are better paid. In such a society, even if GDP per capita were maintained at the same level as when a younger age profile existed, individuals would be better off over their life course. It is more plausible that the tightening labour market would contribute to greater growth in GDP per capita.

Theoretical and empirical treatments of labour dynamics

The literature relating labour supply to wages and workforce participation is contentious and politicised, being entwined with the issue of immigration. Many authors imply that claiming any negative impact from an influx of workers stems from a xenophobic eagerness to blame

immigrants for the systemic wage suppression of neo-liberal economic management (D'Souza, 2002; Jericho, 2021). Those who argue that the demand for labour is near-perfectly elastic and able to absorb any influx without lowering wages (Bond and Gaston, 2011) do not challenge the apparently contradictory notion of a non-accelerating inflation rate of unemployment (NAIRU) (Ball and Mankiw, 2002), which argues that a sizeable pool of unsuccessful job-seekers is required to prevent wages rising. In a period in which the wages share of national incomes has contracted and income inequality has risen, it would seem more rational to welcome conditions that inflate wages and deflate speculative profits on housing.

Theoretical treatments of wage effects of labour dynamics typically conceptualise a "labour supply shock," whereby an injection of immigrants disrupts the unemployment-wage equilibrium temporarily (Rowthorn, 2015; Edo, 2019; Brell and Dustmann, 2019). They do not examine the difference between a constantly growing and a stable or shrinking labour supply. The constant investment needed to expand job creation inherently means a diversion of spending so that less wellbeing is achieved for the same level of GDP per capita (O'Sullivan, 2012; Lee and Mason, 2014; Mason et al., 2016). The "labour supply shock" models are only interested in comparing the post-shock equilibrium with the pre-shock state, and hence tend to ignore the resource reallocations needed to achieve the transition. They thus systemically disregard the main source of economic drag caused by population growth. An industry that is constantly expanding to absorb surplus labour must fund this expansion by having lower production costs for the same product price (models generally assume that the economy is perfectly open, so product price is set exogenously by the global market: Brell and Dustmann, 2019). It follows that lower wages would be an ongoing condition. Conversely, an industry that is not expanding would be able to sustain a higher proportion of revenue going to wages than a similar industry in perpetual expansion.

Under the "labour supply shock" theories commonly espoused (Rowthorn, 2015; Brell and Dustmann, 2019), businesses that benefit from lower wages due to an influx of workers use the windfall to invest in expansion to the point that employment and wages are restored to the previous level. According to Edo's (2019) rationale, capital is globally mobile and infinite, and will flow in to take advantage of the profits afforded by lower wages, but will stop short of fully restoring wages to pre-influx levels. However, such near-perfect elasticity of demand for labour is often not the case. The lower wages might lower product prices, forcing wages down among their competitors, structurally locking in lower wages – a dynamic commonly seen where horticultural or cleaning work is opened to foreign guest workers. Additionally, real estate inflation driven by the extra population growth can attract investment into property and away from job-creation. Any of these dynamics could negate the benefits that econometric models predict will result from bolstering the working-age population.

Brell and Dustmann (2019) "anticipate that an increase in the number of workers of a particular skill level as a result of immigration will lead the host economy to implement technologies that allow absorption of these additional workers." However, as Acemoglu, and Restrepo (2017) argue, it is a tightening labour market that is more likely to incentivise technologies that improve productivity. The presence of abundant labour tends to disincentivise mechanisation. Innovations such as Uber emerge to exploit the under-employed, but highly motivated, job-seekers through the "gig economy," circumventing minimum wage regulations. This sort of innovation lowers economy-wide productivity.

Empirical studies on the impact of a change in workforce are usually framed as contrasting immigrants with native-born workers, rather than seeing the source of labour supply as

incidental to its growth or contraction. They ask whether immigrants are qualitatively different from the incumbent population, and whether they are complimentary or competitive with native workers. Such studies lack a counterfactual scenario in which less immigration occurs. Instead, they use the different proportions of migrants in different geographic areas or different subsets of the workforce as surrogate counterfactuals. This is problematic because the uneven distribution of immigrants is inherently driven by endogenous factors that invalidate "all else being equal" comparisons, and discount the feedbacks by which an influx of immigrants in one area or industry cause changes in labour supply in others (Borjas, 2003; Bond and Gaston, 2011). A common empirical framework is to disaggregate immigrants and incumbent people into skill and experience classes based on educational attainment, and compare the wage trends in such subsets with their immigrant share (Borjas, 2003; Bond and Gaston, 2011; Breunig et al., 2017; D'Souza, 2020).

In a context in which immigrants were more concentrated in low-skilled classes, Borjas (2003) found a negative impact of immigrant share on native wages and employment. In contrast, when immigrants were nominally more skilled and experienced than the native population (Bond and Gaston, 2011; Breunig et al., 2017; D'Souza, 2020), a positive impact of migrant workers was claimed because wage growth was weakest among the low-skilled and recent graduates. These analyses depend on assuming that people do not work below their level of qualification, and therefore don't compete with lower-skilled workers. This assumption is very far from realistic, particularly for recent migrants (Birrell, 2018; Boucher, 2016) but also for young native-born entrants to an oversupplied labour market (Productivity Commission, 2020). The dependence of these studies on longitudinal household surveys is also problematic as they under-represent recent migrants and omit temporary migrant workers (Breunig et al., 2017; D'Souza, 2020). Even if these problems were overcome, such analyses have not evaluated growth or contraction of labour supply relative to consumer demand.

The most common consensus from this literature is that groups that are more directly substitutable by immigrants are negatively affected, while those that are complementary may be positively affected, but this is not always the finding (Edo, 2019). By focusing on the impact on wages of native-born workers, most studies omit comment on the economy-wide impact on wages and income inequality, across both migrants and non-migrants. From our perspective, seeking insights from this literature on the fate of naturally tightening labour markets, this omission is unhelpful. In general, these studies agree that an influx of workers lowers the cost of labour inputs, while increasing the expenditure on capital inputs and widening inequality. It merely seems to be assumed that such an outcome is not negative if the poorly paid people are migrants.

The up-side of aging and declining populations

Moral arguments pertaining to the scale of immigration programs are beyond the scope of this paper. Here, we are only concerned with the case for higher population growth based on the self-interested argument that a shortage of workers must be avoided. It is this case that we find to be ill-founded. The pervasive belief in this shibboleth is blinding policy-makers from appreciating the many social and environmental benefits that could result from population aging and contraction (Kluge et al., 2014). Benefits might include:

- reduced stress levels as work is more secure and on terms more favourable to workers;

- reduced cost of living, particularly for housing, due to reversal of the speculative inflation of land values that accompanies population growth, and due to an increase in inheritance per capita;
- improving environmental amenity, including access to uncrowded natural areas and reduced urban congestion and pollution, and including lower levels of climate change;
- greater social cohesion as disadvantaged groups increasingly have access to better employment, housing and public infrastructure;
- more volunteerism, with a growing proportion of able-bodied retired and semi-retired people;
- more public investment in each young adult, particularly in education, as the youth cohort shrinks, and as a tighter labour market values higher education and skills.
- with more work and lower housing costs, adults have the opportunity to save more through their working life, and to spend during their retirement, supporting wealth transfers down the generations;
- a more meritocratic society, which comes with public funding of higher education and less opportunity for enrichment through what we might consider parasitic activities, such as speculative investment in inflating real estate and profit-taking from exploitative terms of employment;
- better and more stable government, which follows from a more meritocratic culture and a more cohesive and inclusive society.

While these 'depopulation dividends' might be speculative, there is evidence that the pursuit of higher population growth to ward off the 'aging crisis' is having the reverse effect on each of these items.

Conclusions

The assertion that demographic aging will cause a shortage of workers and constrain economic growth has become axiomatic across the developed world (e.g. Bricker and Ibbitson, 2019; Vollsett et al., 2020). This paper finds that this assertion is unjustified. To date, aging has not meant that fewer people are employed, but fewer are *unemployed*. Given the projected limits to the extent of aging, the proportions of working-age people currently not employed and the increasing tendency of older workers to defer retirement, it seems likely that workforce feedbacks will continue to meet demand for workers.

The data presented here support the conclusion that the scale and composition of the workforce is shaped to a greater extent by demand for workers than by their supply. Adding more working age people does not appear to result in more hours of employment per head of population. Similarly, increasing the levels of higher education in workforce entrants does not necessarily make the economy more skills-intensive.

If modern economies only generate enough demand to employ about half the people, it is far better that those outside the workforce are happily retired and constructively engaged in society, than unemployed youth, denied entry into the social contract and likely to express their frustrations in ways that are destructive to themselves and to society.

Whether or not aging and declining populations are considered detrimental or beneficial depends on whose interests are served. For big businesses and real estate traders, there are advantages to a growing pool of customers and an oversupplied labour market. For the majority of households, a tight labour market is much more favourable to their lifetime

earnings, a slack housing market lowers their cost of living, and environmental amenity is favoured by ending densification. For national economic statistics, the fiscal burden of elderly support is off-set by lower demands for infrastructure and education, without quantifying likely savings in unemployment benefits, family support, policing and correctional services. Aggregate GDP growth will be favoured by population growth, but wealth per capita and poverty reduction are more likely favoured by declining populations. When we add the benefits of a healthier environment and greater capacity to transition away from fossil fuel use, older and decreasing populations look very appealing.

There are many policy options available to governments to adapt society to depopulation and aging, to improve the affordability and fairness of pension and health care systems and to enhance workforce participation (Bloom et al., 2015; Gratton and Scott, 2016; The Economist Intelligence Unit, 2020). For the most part, we can expect market forces to achieve the adjustments needed, if governments recognise and remove inadvertent barriers to change. A tight labour market is among our greatest allies in this transition, helping to achieve a more efficient, inclusive and equitable society.

As the eminent British economist Adair Turner (2014) concluded:

"If aging populations lead to secular stagnation, the cause will be deficient policies. By contrast, the problems created by excessively rapid population growth are rooted in real and unavoidable constraints. The manageable challenges created by rising life expectancy and lower birth rates should not be allowed to obscure the huge benefits of greater longevity and population stabilization. And it certainly should not blind us to the adverse economic and social consequences of rapid population growth."

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