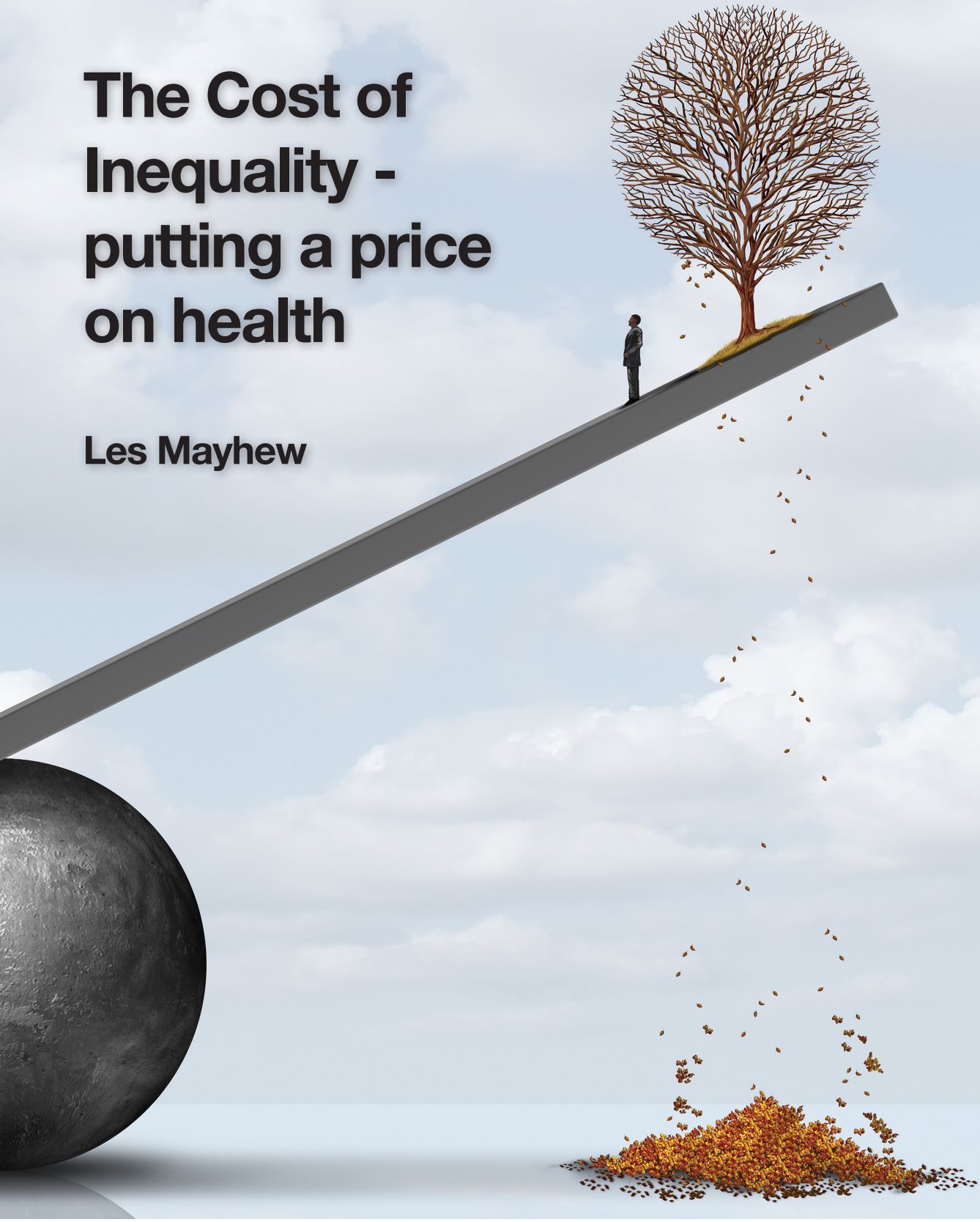
The Cost of Inequality - putting a price on health

Les Mayhew



ilc...
International Longevity Centre UK

CASS BUSINESS SCHOOL
CITY, UNIVERSITY OF LONDON
EST 1894
Changing more than a name

CSFI
Centre for the Study of Financial Innovation

The Centre for the Study of Financial Innovation is a non-profit think-tank, established in 1993 to look at future developments in the international financial field – particularly from the point of view of practitioners. Its goals include identifying new areas of business, flagging areas of danger and provoking a debate about key financial issues. The Centre has no ideological brief, beyond a belief in open markets.

This CSFI publication is available through our website www.csfi.org

Published by Centre for the Study of Financial Innovation (CSFI)

Email: info@csfi.org
Web: www.csfi.org

ISBN: 978-1-8381398-2-7

Printed in the United Kingdom by Heron Dawson & Sawyer

Contents

Foreword

The UK Government is planning a 'levelling up' White Paper for the autumn, so this new research by Les Mayhew is very timely.

Much of the White Paper will be focused on narrowing regional inequalities. But will that be enough? Listening to the debate on inequalities, one will be forgiven for thinking that "levelling up" is just about pumping investment into an area, and hoping that everything will be alright. Sadly, it is not as easy as that. Yes, infrastructure - such as new hospitals and schools and better transport connectivity - and jobs are important. But so also is human capital, and if that capital is not up to scratch there will be greater mismatches in productivity between rich and poor areas, more ill-health and shorter working lives.

This is only part of the story, because the proportion of life spent in good health is negatively correlated with lifespan to an economically devastating effect. We know, for example, that life expectancy varies by up to 12 years between top and bottom deprivation percentiles. For those living in the most deprived areas, it leads to shorter working lives, earlier exit from the workforce, higher health and welfare spending - and very often also to economic hardship. The sadness is that just throwing money at the problem, while welcome, will not cure it. Inequalities in society are deeply embedded – they have been around for as long as we have been measuring them, and probably since the dawn of time. More importantly, they have been getting worse, as all the latest research suggests.

Les tackles the problem head-on by analysing the fundamental causes of inequalities in a refreshingly innovative way, using basic demographic concepts like health and life expectancy, and then linking them to basic economic variables such as economic activity, GDP, public spending and taxes. By quantifying the link between good health, life span and economic output in a simple way, this means that we can now say what the economic value would be of an increase in healthy life expectancy on working lives, and on life expectancy itself. Les then uses his findings to test scenarios aimed at quantifying the economic value of health improvements.

In principle, his approach means we can address such questions as whether life extensions are affordable without improvements in health, the central role of productivity in paying for an ageing society, and wider questions such as the future of work and remuneration in the information age. Although his approach is still experimental, he sets out clearly his findings thus far, their implications for policy and also the next stages in the research. Les joined the ILC in October last year as head of global research, but has had a long association with the ILC over many years. We look forward to working with him in the next stages of this work, and applying the findings and insights in our wider work.

David Sinclair
Director, International Longevity Centre (ILC)

Preface

This is the fourth paper by Professor Les Mayhew that the CSFI has published. All four have looked at health and ageing as they affect UK society and the economy – and, indeed, the tough financial choices that the government will have to make going forward.

This paper, however, differs in two important ways.

First, it is very much an 'early harvest' of work that Les is currently undertaking. Indeed, it could be seen as a prospectus for a much more comprehensive study that (I hope) he will be able to carry out. And, second, it is directly addressed to the 'levelling up', post-Covid agenda to which this particular government is committed. Potentially, it gives politicians and government officials a new way of looking at the causes of inequality – and a metric by which they can assess the efficacy of various policy interventions.

It is also new in two ways. One is that it makes a very clear distinction between overall life expectancy, working life expectancy and healthy life expectancy – and illustrates how they do not move in lockstep, but are greatly affected by the relative level of deprivation in the various communities of which England is composed. (Les looks at 150 English districts for which data is available.) And second, it proposes a hypothetical local tax as a way to reflect the degree of local deprivation and to predict the impact that government interventions might have.

The paper is aimed squarely at policy-makers who will have to make tough decisions on health and well-being – decisions that go beyond simple promises to boost life expectancy. Obviously, I want to thank Les for producing the paper – and to urge him to take the work further. I also want to thank the Business School at City University (soon to be the Bayes School) for its support.

And, I want to thank my colleague, Jane Fuller, who worked hard with Les on the paper. That it reads very well is testimony to her.

Andrew Hilton
Director

CSFI

Number 138 July 2021

The Cost of Inequality – putting a price on health

Les Mayhew

Summary

One of the UK's great achievements is that people are living longer than they did just a few decades ago. But an ageing population has its cost: it increases pressure on health and social care, on welfare payments and on pensions – and hence on taxes. At the same time, however, it is recognised that older people can make a big contribution to the economy, although poor health remains an obstacle to them doing so. The inequalities can be seen in different parts of the UK, manifesting themselves in shorter working lives, higher healthcare costs, higher welfare payments and income poverty.

At present, there is no simple measure that links health on the one hand to economic disadvantage on the other – and so to the tax burden that is needed to pay for health and welfare services. Nor is there adequate understanding of how working lives respond to health improvements, or of the efficacy of focusing spending on treating the sick versus policies designed to maintain and improve health. This paper challenges the conventional wisdom by proposing a novel way of thinking about inequalities that links health to wealth and to the economy.

We show, for example, that a one-year extension in healthy life expectancy would add around 3.4 months to working lives and 4.5 months to overall life expectancy – and that is could reduce income taxes by 0.6 percentage points based on current data and policies. Although early results are only indicative, they speak to the simplicity of the approach and to its potential applications as the UK tries to 'build back better' after Covid-19 and to 'level up' deprived areas.

We also show that it is generally more efficient to focus policy on increasing healthy life expectancy than on extending the total life span. The latter would tend to shunt more health and care costs to the end of life without extending working lives. In principle, these costs could be met by, say, increasing the state pension age and by higher taxes, but there are diminishing returns and a heavy price would have to be paid. Productivity growth, long the Achilles's heel of the UK economy, would help, but is not guaranteed and could widen inequalities further.

What is new about the methodology applied in this study is the way we measure the scale of this inequality. We do this by imagining a situation in which each local area is responsible for financing its own public services and that the tax base is people's earnings. In other words, we hypothesise that a local tax is levied to cover healthcare costs, welfare benefits for those sick and unable to work, and state pensions**.** Areas in good health and with high levels of economic activity would require

lower tax rates to support the sick and elderly; the reverse would be true for areas of poor health, lower economic activity and an ageing population.

Differences in these hypothetical tax rates between districts provide a summary measure of inequality. They also indicate how this might be mitigated by policies aimed at improving health and productivity. Our approach means that we can quantify the scale of disadvantage suffered by any local area, identify the causes of that disadvantage and improve decision-making on what needs to be done to reverse it.

To do this, a total of 150 districts in England were analysed and divided into 27 categories according to three ratings – high, medium and low – for each of the three key life spans: life expectancy, healthy life expectancy and working life expectancy. For the majority of districts, average healthy life expectancy falls short of the state pension age. Indeed, as noted in a previous CSFI report, *The Dependency Trap*[1], economic activity rates start to decline from the age of 50 and the trend accelerates into old age.

Applying measures of average earnings and state pension and benefit payments, an imputed tax rate can be worked out for each district – as if it were making these payments itself out of local earnings. These tax rates range from 21% to 33% – with the highest rates in the districts that would least be able to afford them. This both captures the need for redistribution of tax revenues and points to the economic advantages of levelling up.

The research also considered the impact of changes in healthy life expectancy. For instance, an addition of five years to HLE would increase life expectancy by nearly two years – but working life by less than one year. The latter, relatively modest, effect suggests that other measures are also needed, such as an increase in the state pension age.

The report urges the government's new Office for Health Promotion[2] to support joined-up research that offers real solutions. This means working not only with bodies that promote improvements to healthy life expectancy and longevity, but also with those focusing on raising productivity and levels of economic activity as part of the 'levelling up' agenda.

1 Mayhew. L.D. (2018) The Dependency Trap – Are we fit enough to face the future? Centre for the Study of Financial Innovation (CSFI). Special CSFI report in conjunction with the Business School (formerly Cass), City University, London.

2 The new Office for Health Promotion, announced in March 2021, will lead national efforts to improve and level up the health of the nation by tackling obesity, improving mental health and promoting physical activity. It will sit within the Department of Health and Social Care.

Introduction

Successive studies have shown that inequalities are deeply embedded in the UK economy. Even though closing the gap, or 'levelling up', is now high on the political agenda, these inequalities manifest themselves in different ways – through educational attainment, incomes, health, wealth and so on. One particularly telling indicator is the gulf in life expectancy of 12 years between the top 1% of the population, who live in the least deprived districts, and those in the bottom 1%, who live in the most deprived.[3]

How to count the cost of inequality is more complicated than simply cherry-picking a few statistics on why some areas perform better or worse. Is it due to poor health, economic deprivation or other factors? This paper offers more meaningful measurements in an inclusive framework that builds on actual evidence.

Why is this important? In 2018, the Secretary of State for Health and Social Care stated an ambition to increase healthy life expectancy (HLE) in England by at least five years by 2035, while also reducing the gap in life expectancy between the richest and the poorest groups. A delay in providing the details is not surprising given the intervention of Covid-19; however, the pandemic also highlighted public health inequalities.

Others have added their voice. For example, the All Party Parliamentary Group (APPG) on longevity, in a report published in April 2021[4], asserts that the UK has the worst health outcomes in Europe and that this is a drag on economic growth. It argues for a political commitment to level up health and says that "whatever the evidence shows" needs to be done should be done. The newly established Office for Health Promotion is expected to play a major role in this.

We can be sure that focusing on improving HLE will make a positive difference. People would be able to work and save for longer, and health services would be under less pressure. What is missing is the interaction between HLE, economic activity and income levels, and how to put a value on the related causes of disadvantage – or on the benefits of tackling them. This risks repeating the mistake of designing policy with too narrow a focus. The crucial question is how to deliver this ambition in a more integrated way.

An unhelpful trend is that income inequalities are firmly entrenched and, indeed, have increased slightly in recent years. There has long been evidence of the downward trend in labour's share of GDP, with globalisation and technological change as the oft-cited causes (e.g. OECD, 2015[5]). The higher share accruing to capital has been associated with higher income inequality - and by extension with inequality of health outcomes (e.g. Thomas Piketty 2013[6]).

Inequality in sharing the benefits of GDP growth has affected geographic areas and socio-economic groups differently. We can see this, for example, among the large number of adults aged over 50 but yet to reach state pension age who are economically inactive through redundancy, long-term sickness or disability, or as a result of skill gaps. Such disadvantages are felt most acutely in 'left behind' areas – especially where wages and benefits are the main sources of income.

In this paper, we introduce a new way of measuring the scale of this disadvantage. We imagine a situation in which each local area is responsible for financing its own public services out of taxes, and that the tax base

3 Mayhew, L. , G. Harper, G. and A.M. Villegas (2020) An investigation into the impact of deprivation on demographic inequalities in adults , Annals of Actuarial Science, 14, pp. 358–383 doi:10.1017/S17484995200000682
4 All Party Parliamentary Group for Longevity. Levelling Up Health (April, 2021).
5 Keeley, B. (2015) Income Inequality-The gap between rich and poor. OECD
6 Piketty, T. (2013). Le Capital au XXIe siècle (Paris: Seuil).

is local people's earnings. A local tax would be levied to cover healthcare costs, welfare benefits for those sick and unable to work, and state pensions. Clearly, areas where the general level of health is good and where economic activity levels are higher would require lower tax rates to support the sick and elderly. Equally, the reverse would be true for areas of poor health, lower economic activity and an ageing population.

The differences in these hypothetical tax rates are an important proxy for the underlying financial pressures on public services and pensions, and for the inequality between areas. It is, we believe, the first time anyone has attempted to produce this kind of metric.

Putting a value on longevity and health

It might seem cold-blooded to put a price on poor health, rather than simply to call for more spending on services. But by measuring the financial impact of poor health on welfare payments, pensions and earnings, policy-makers can turn their attention to preventative action, as well as reacting more effectively to immediate needs. To give an illustration, higher labour participation generates more output, more consumption and a larger tax base, but only if the workforce is in good health. In an ageing population, this is challenging since declining health limits participation rates and has a negative effect on healthcare costs and welfare payments.

We can think of the cost of inequality as the required size of the tax base [7] to fund these essential services. If this were funded locally, inequality would be exacerbated by the adverse impact of high taxation on living standards. Equally, there would be a financial, as well as social, 'dividend' if inequalities could be eliminated and the savings re-invested. The analytical approach used for this study estimates what the hypothetical local tax rates would need to be to pay for pensions, disability benefits and healthcare based on the earnings of a representative population over its life course. To summarise, there are four main arguments for this approach:

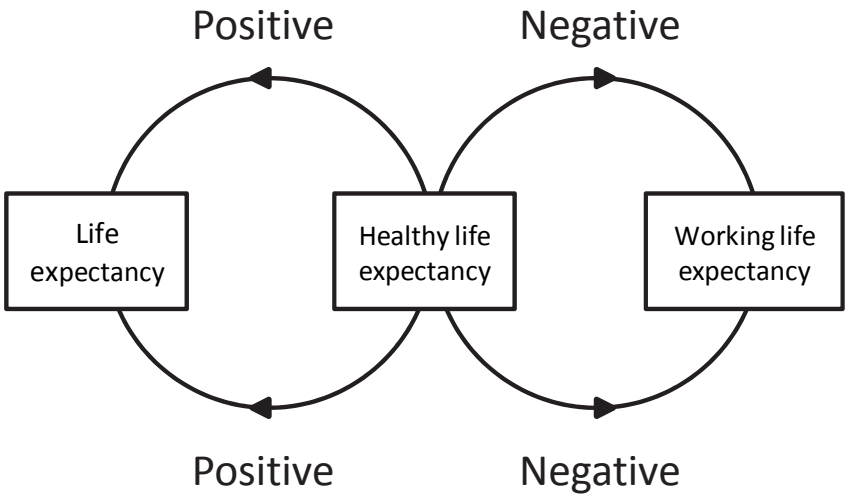
- Identifying the main contributors to the cost of inequality provides a rigorous basis for the 'levelling up' agenda.
- Human capital is a primary driver of well-being and wealth, and so priority should be given to promoting productivity, healthy behaviour and investment in education and skills.
- Reducing the wealth gap between different areas of the UK should reverse the phenomenon of people, resources and investment gravitating to more affluent areas.
- Assuming one can establish a direct relationship between output and health, the use of a tax metric provides a better basis for redistribution.

An underlying assumption is that people are independent actors who engage with and react to the environment in which they live and work. In our model, we make health the focus of attention. For example, we know that ill health correlates with adverse lifestyles, shorter healthy life expectancy, higher mortality and shorter working lives. Structural economic changes, such as the decline in manufacturing, have contributed to ill health through redundancy, long-term unemployment and income loss. In the new digital economy, the same might occur in sectors such as retail, as shopping habits change and jobs are automated.

Figure 1 shows the hypothesised interactions between life, health and working life expectancy. If healthy life expectancy is improved, we would expect this to feed through into both longer life expectancy and longer working lives. If it falls, we would expect the opposite to happen.

7 Modelled tax rates are an indicator of this process but not the solution. This is because economies rely on other sources of income such as rents and dividends accruing to landlords, business owners and ordinary savers. Although wealth creation is not just about jobs, jobs sustain families and communities especially in the early stages of the life cycle.

Figure 1: Impact (positive or negative) of rising or falling healthy life expectancy on life expectancy and working life expectancy



It is important to remember that increases in life expectancy are not always matched by health improvement. Indeed, there is evidence that the gap between overall life expectancy and healthy life expectancy is widening. This means that the cost of providing healthcare, social care and financial support to the elderly, relative to the rest of the population, will increase. Furthermore, economic resources will be diverted from wealth creation into care provision.

Chapter 1: Life, health and working lives defined

Life expectancy (LE) is defined as the number of years a person is expected to live, and is usually measured at birth. However, since we are interested in working lives, it is more appropriate for us to use a starting age of 20. Healthy life expectancy (HLE) is defined as the number of remaining years that an individual can expect to have in "very good" or "generally good" health. HLE is strongly correlated with the number of years an individual can expect to live without a long-term limiting illness. Although it is theoretically possible for HLE and LE to be the same, in practice most people die after a long or short illness. The gap between LE and HLE is the number of years spent in greater or lesser ill health at the end of life.

Working life expectancy (WLE) is the expected number of years spent being economically active between entering work and retirement. If we assume, for the sake of argument, a post-education starting age of 20 with a conventional end point of 65, then a person who is active for the whole of that period has a working life of 45 years. For many, the age of 65 corresponded with the UK's state pension age (SPA), but with the raising of the SPA to 66 (and further increases planned), this no longer applies. Because of the scrapping of the default retirement age, SPA is increasingly redundant as a proxy for retirement age although it remains a reference point for welfare and other administrative purposes.

There are practical reasons why any single 'retirement' age should be treated with caution. Labour force data shows that economic activity reaches a maximum of between 80% and 90% between the ages of 20 and 55. Activity rates slowly decline from about age 50 – in other words, long before 65 – for reasons such as poor health, redundancy and age discrimination in staff recruitment and retention. This trend continues into old age and accelerates, so that that the availability of potential workers falls sharply beyond age 70.[8] To give an example, suppose the average activity rate between 20 and 65 is 0.8, this would equate to 0.8 x 45, or an average 36-year working life in the steady state. In theory, labour market data could be extended to whole life with some small tweaks to current labour market statistics, but the extra working years generated post-65 would be quite small in this numerical example owing to the much lower activity rates in old age.

2.1 A worked example

It will be recalled that we calculate LE, HLE and WLE from age 20; therefore, to determine the expected ages of death, the onset of ill health or when work ceases, we need to add 20 years to our data. We call the new figure 'life span' or 'expected age of death', which is simply LE at age 20 plus 20 years. Its main purpose is to enable us to present results in chronological age, rather than in terms of future years of life. Thus, if LE at age 20 is 60 years then the expected age of death would be 80; if HLE at 20 is 50 years, then the expected age at which poor health kicks in would be 70; if WLE is 40 years then the expected age when a person ceases to be economically active is 60.

To analyse local variations in LE, HLE and WLE, we need a dataset that covers each domain in every local authority area in England, without overlap.

8 Mayhew, L.D. (2018) The Dependency Trap – Are we fit enough to face the future? Centre for the Study of Financial Innovation (CSFI). Special CSFI report in conjunction with the Business School (formerly Cass), City University, London.

Fortunately, there is such a set, made up of unitary authorities, metropolitan boroughs, London boroughs and counties.[9] In total, our list comprises 150 districts covering the whole of England. Extending this to the rest of the UK would be an obvious next step in the research. While health data and labour market statistics are not always consistent between geographic areas, the data is good enough to produce meaningful results.

Table 1 splits districts into five-percentile steps, from districts with the shortest life span to those with the longest. For illustrative purposes, the analysis is based on males, but it would be straightforward to include females in further work. It shows:

- A widening gap in life, health and work spans between the lowest 5% of districts and the 95th percentile. The differences are indicative of shorter working lives and higher health costs over the life course in the lowest percentiles.
- Variations within percentiles are also wide. For example, there is a 19.9-year gap between life and health spans in the lowest 5% compared with a 13-year gap in the 95th percentile. This means that only 74% of lifespan is spent in good health in the former, compared with 85% in the latter.
- More years are spent being economically inactive in the bottom 5% than in the 95th percentile, even though life span is lower in the former. In the 5th percentile, 96% of a much lower health span is spent in work compared with 88% in the 95th percentile, indicating a longer period of healthy retirement for the latter.

Table 1: LE, HLE and WLE by percentile of districts ranging from the 5th percentile (lowest) to the 95th percentile (highest) (Note: bold figures are the median lower and upper quartile values)

		Percentile						
	Indicator	0.05	0.1	0.25	0.5	0.75	0.9	0.95
A	Life span (yrs)	76.7	77.2	**78.0**	**79.2**	**80.3**	81.2	81.6
B	Health span (yrs)	56.9	58.0	**59.8**	**62.9**	**65.4**	67.9	68.6
C	Work span (yrs)	54.5	55.1	**56.3**	**57.6**	**58.7**	59.7	60.1
A-B	Life-health (yrs)	19.9	19.1	18.2	16.3	15.0	13.3	13.0
A-C	Life-work (yrs)	22.3	22.1	21.7	21.5	21.6	21.5	21.5
B-C	Health-work (yrs)	2.4	3.0	3.5	5.3	6.7	8.2	8.5
B/A	Health/Life %	74	75	77	79	81	84	84
C/A	Work/Life %	71	71	72	73	73	73	74
C/B	Work/Health %	96	95	94	92	90	88	88

9 ONS gives a nine character code to each every administrative area. In our cases they are pre-fixed E06, E08, E09 and E10 using the national GSS system. For example, Portsmouth is E06000044, Liverpool E08000012, Islington E09000019 and E10000019 Lincolnshire

There are other important implications that can be drawn from this table. For example, it is reasonable to conclude the following:

- A widening gap between health and life expectancy is bad for the economy because it implies that more years of life are spent in ill health and economic inactivity, with negative implications for health, social care and welfare costs.

- Work span is lowest in districts with the shortest health spans, and is always less than healthy life span. The gap tends towards zero in the lowest percentiles, but in the highest percentile it is 8.5 years and trending higher. We may infer that short healthy life spans are a key obstacle to longer working lives.

- Increasing the number of years spent in good health following exit from the labour market is good for the economy because healthy people consume more and are available for other activities, such as volunteering and providing care within the family. They also consume less in benefits and NHS resources.

These patterns are also borne out, virtually without exception, if we drill down to individual local authority level.

Chapter 2: Drilling down to district level

Which combinations of life, health and work span are most advantageous? If we knew this we should be able to devise policies that accentuate positive rather than negative outcomes. For example, policies that require people to spend their whole lives working would be hugely unpopular. Policies that prioritise life span over health span would bankrupt the healthcare system by subsidising poor health – a sensitive issue, but one that puts a clear value on the cost of poor health to the economy. Similarly, policies that do not look after the welfare of workers would be disastrous for the economy. If it were possible to show that the most successful districts are also the healthiest, methods could be developed to weight life, health and work spans to promote the most favourable outcomes for society.

One mechanism is needed to compare districts based on LE, HLE and WLE, and a second to put a value on inequalities. Since there are 150 districts in our database, it makes sense to group like with like. How we do this is explained below. In the introduction, we posed the hypothetical question of what tax rates would be required if each district (or group of districts) were held responsible for its own health, welfare and pension costs. Currently, these costs come in different forms and are typically contained in the budgets of different government departments. They are usually demand-led rather than capped. As a result, some districts will receive higher levels of funding than others, but there is no accessible data for the total value of these transfers.

We can, however, make a few simplifying assumptions.

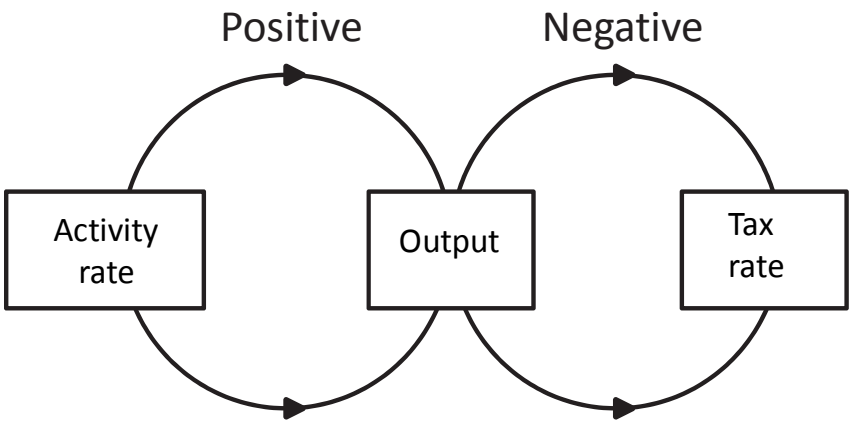
To keep it simple, we include the cost of providing healthcare, state pension costs and disability benefits in our calculations, but ignore other areas of public expenditure such as education and training and defence. As a further simplification, we also levy our hypothetical tax solely on income, although this could be changed to include other taxable revenue streams in future applications. An obvious criticism of this approach is that it does not take into account the value of other outputs, such as profits and rents, and non-remunerated activities such as care and volunteering. However, our aim is more limited in this early stage of the research – it is to understand a set of financial effects based on a few important factors, so that we can isolate the economic value of healthy ageing and working longer.

Although we can treat each district separately, in this paper we have chosen to put each district into sub-groups. This simplifies the presentation of the results and enables us to observe patterns and trends. We assign to each district a code according to whether life, healthy life or working life expectancy is high (H), medium (M) or low (L) using quartile cut-off values (these are emboldened in Table 1). For example, a district with the code 'HML' has a life span in the top quartile (>80.3 years), health span between the 25th and 75th percentile (between 59.8 and 65.4 years) and work expectancy in the bottom quartile (<56.3 years from birth, or <36.3 years from age 20). A district with the code 'LLL' would be among the most deprived, in all three senses, and one with 'HHH' among the most advantaged. With three outcomes per category, 'H' 'M' and' L', there are 27 different types of area.

The treatment of taxation is more complicated. Take the state pension, which is not directly affected by a person's health, employment status or life expectancy. A PAYG system, it is paid for out of general taxation and is in continuous payment until death, so the age at which it is set will affect the results. The general relationship between activity rates, total income and taxes is shown in Figure 2. The more economically active the population, the greater its productivity in the form of higher wages

and higher output. Higher output, in turn, increases the tax base to pay for healthcare, welfare and pensions, and so the tax rate would accordingly be lower. Lower output would, of course, have the reverse effect – fewer goods and services, and higher taxes.

Figure 2: The positive/negative relationship between activity rates, output and taxes



The next step is to put values on each of the variables in the framework in order to estimate outcomes in tax terms. A person could be in good health or bad, pre- or post-SPA, in work or not. It is known that health costs rise significantly in old age, so we approximate this by assuming different rates of expenditure depending on whether someone is aged above or below the SPA (the model uses the conventional age of 65). This seems reasonable since pension age is determined by a range of factors averaged out over the population, the costs of which vary by health and disability as well as by age.

We then split remaining life into the following quantities expressed in this identity:

Expected remaining life

=

Expected healthy working life + Expected unhealthy working life

+ Expected healthy retired life + Expected unhealthy retired life

The next step is to attach financial quantities to each element of the relationship. Lifetime income is defined as being equal to working life expectancy times average earnings. In the same way we can calculate lifetime adult healthcare costs and the cost of disability benefits using the expected number of years in ill health (i.e. life span minus health span) multiplied by the going rates for each cost category. We can also calculate a representative local, hypothetical tax rate for an individual in any of our districts over his or her life (or remaining life span), as follows:

Tax rate = lifetime consumption of health, welfare and pensions ÷ lifetime earnings

Where

1. Lifetime earnings (output) = average earnings x work span
2. State pension received = (life span-SPA) x average value of state pension
3. In-work disability benefits received = (SPA-years spent in good health from age 20) x average in-work disability benefit rate
4. Post-SPA disability benefits received = (life span-SPA-healthy years post SPA) x average post-SPA disability benefit rate
5. Healthcare costs pre-SPA from age 20 = years spent in poor health x average health costs per annum
6. Healthcare costs post SPA = years spent in poor health to the end of life

For long periods, the representative tax rate is likely to be fairly stable. Assuming a broadly constant number of births and deaths, the tax rate for the population will be the same as for the representative individual at any point in time. We exploit this result later when we link output to GDP and productivity.

Most of these definitions are easy to comprehend. State pension age was set at 65 in the base case, its value pre-December 2018, but it is a parameter that can be varied to show the effects not only of changes in health and life span but also taxes.

The final step is to insert values for each parameter such as average earnings. These values are summarised in Table 3 below. They are assumed for the purposes of illustration but are consistent with actual UK averages. Note that in further research these would be disaggregated by district – a step that is feasible but involves a large amount of prior work to assemble the data.

Table 2: Values of each variable used in the illustrative case

Variable	Value
SPA (state pension age)	65 years
Adult working life (start age)	20 years

Variable	Value £ per annum ('000)
Earnings	25.0
State pension	8.0
Working age disability benefits	10.0
Disability benefits post-SPA	5.0
Health care costs pre-SPA	1.0
Health care costs post- SPA	2.5

Chapter 3: Results

The results are set out in Table 3. This table allocates each district to one of the 27 district types using the H, M and L convention. Each row includes the number of districts allocated to each category and the imputed tax rate, based on the methodology set out above. A final column provides examples of districts allocated to particular categories. The most common categories are HHH, MMM and LLL, accounting for 42% of the districts analysed. The HHH category mostly includes districts such as Wokingham, Bromley and Oxfordshire in the wealthier south-east of England. The MMM category includes districts such as Leeds, Medway, Greenwich and Cornwall, and is more spread out. The bottom row gives examples of the 18 districts in the LLL category, including Manchester, Birmingham and Liverpool. A full list can be seen in the Appendix.

Some of the least common combinations may indicate special circumstances. An example is MML with medium life and health spans but a low work span. This includes districts such as Bournemouth, Brighton and the Isle of Wight, which are holiday destinations with seasonal work. If the labour market were more robust, would that improve health and life spans? Another interesting category is HHL for which there is only one example – Kensington and Chelsea, the richest borough in the country with well above average levels of economic inactivity. Is that because it is a popular destination for the wealthy retired? Or is there an above average proportion of the population living on rents and dividends? Or is the average resident simply able to retire early?

Just as intriguing are the eight null categories for which there are no identifiable districts. These have unusual combinations, such as high health span coupled with a low life span (or vice versa), cases with two 'L's and an 'H' such as rows 9, 21 and 25 and so on. These cases signify, for example, the incompatibility of having long life expectancy coupled with poor health and shorter work spans. In other words, a person with low health expectancy will tend to have a low or medium life span and vice versa. If we test the hypothesis that work and health spans are correlated, we find this to be highly statistically significant ($p<0.001$), vindicating the theory that work is good for health and that health is good for work – obvious perhaps, but good to see it confirmed in the data.

Table 3: Districts ranked on life, health and work span

No.	Category *a*	Number of districts in each category	Implied income tax rate % *b*	Examples
1	HHH	14	23.0	Wokingham, Bromley, Oxfordshire, Windsor and Maidenhead
2	HMH	6	25.9	Wiltshire, Ealing, Sutton, Hertfordshire
3	HLH	0	**n.a.**	**Null category**
4	HHM	8	24.2	Surrey, Richmond upon Thames, Solihull, North Yorkshire, Poole
5	HMM	6	26.7	Suffolk, Leicestershire, Redbridge
6	HLM	0	**n.a.**	**Null category**
7	HHL	1	29.7	Kensington and Chelsea
8	HML	3	30.4	Solihull, Camden, Westminster
9	HLL	0	**n.a.**	**Null category**
10	MHH	7	22.5	Northamptonshire, Essex, Warrington
11	MMH	8	24.7	Swindon, Slough , Shropshire, Trafford
12	MLH	2	30.2	Tower Hamlets, Lambeth
13	MHM	8	23.4	York, Reading, Cheshire East
14	MMM	31	25.8	Leeds, Medway, Calderdale, Greenwich, Cornwall
15	MLM	6	29.2	Telford, Bristol, Plymouth, Sheffield
16	MHL	0	**n.a.**	**Null category**
17	MML	9	28	Bournemouth, Brighton, Isle of Wight, Sefton, Coventry
18	MLL	3	32	Durham, Redcar and Cleveland, Hackney
19	LHH	0	**n.a.**	**Null category**
20	LMH	1	25.6	Derby
21	LLH	0	**n.a.**	**Null category**
22	LHM	0	**n.a.**	**Null category**
23	LMM	6	25.8	Darlington Bury, Bradford
24	LLM	9	29.0	Salford, Newcastle, Doncaster, Barnsley, Barking and Dagenham
25	LHL	0	**n.a.**	**Null category**
26	LML	4	26.7	Stoke, Portsmouth, Wirral
27	LLL	18	30.0	Hartlepool, Manchester, Liverpool, Birmingham, Nottingham
	Total	**150**	**26**	

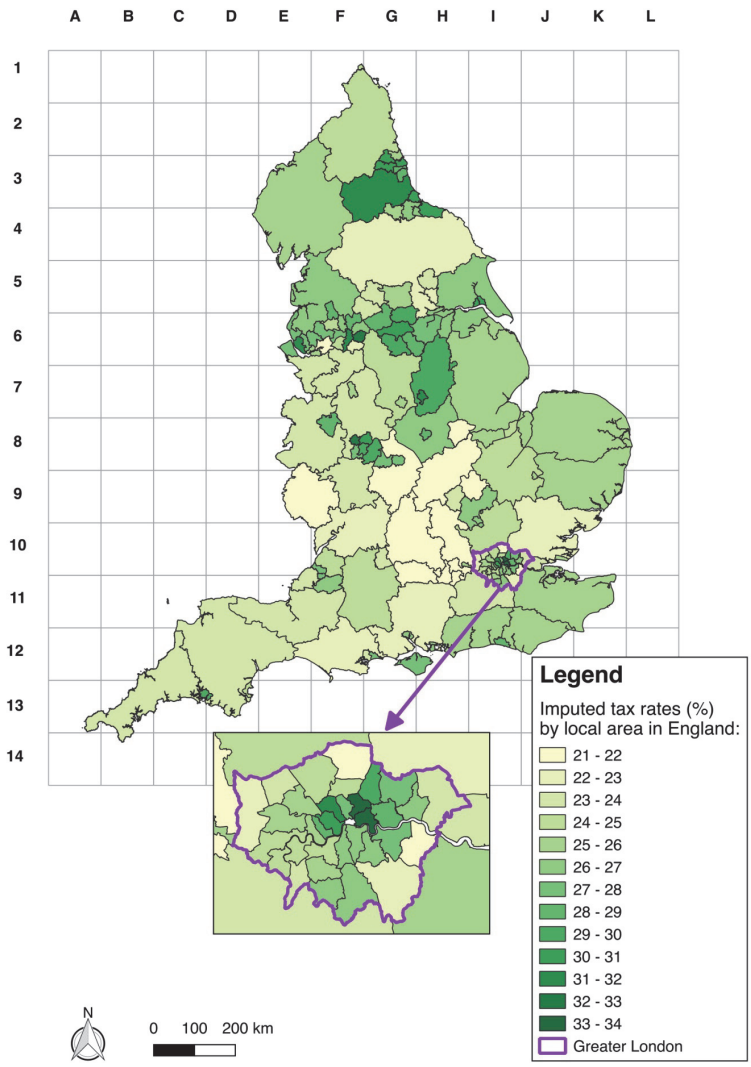
Note a: Letter order is life, and then health followed by work expectancy; note b, see also next section

Turning to the imputed tax rates in the next column, we see that these range from 22.5% to 30.4% with an all-district average of 26%[10]. Areas taxed at higher rates are effectively paying the price for poor health and work spans relative to other areas. For example, towns and cities such as Hartlepool, Birmingham and Manchester in the LLL category have tax rates at the high end of the range while those at the head of the table in the HHH category have the lowest tax rates. Reported tax rates are based on the average of rates for individual districts

10 At the individual district level the rates range from 21.3% in Warrington (MHH) to 33.7% in Tower Hamlets (LLL)

in each sub-group and so may not follow in exact rank order. This is usually due to that fact that there may be only a small number of districts in any particular category. Derby, for example, with a tax rate of 25.6% is the only representative in the LMH category.

Figure 3: Map of England showing imputed tax rates by district

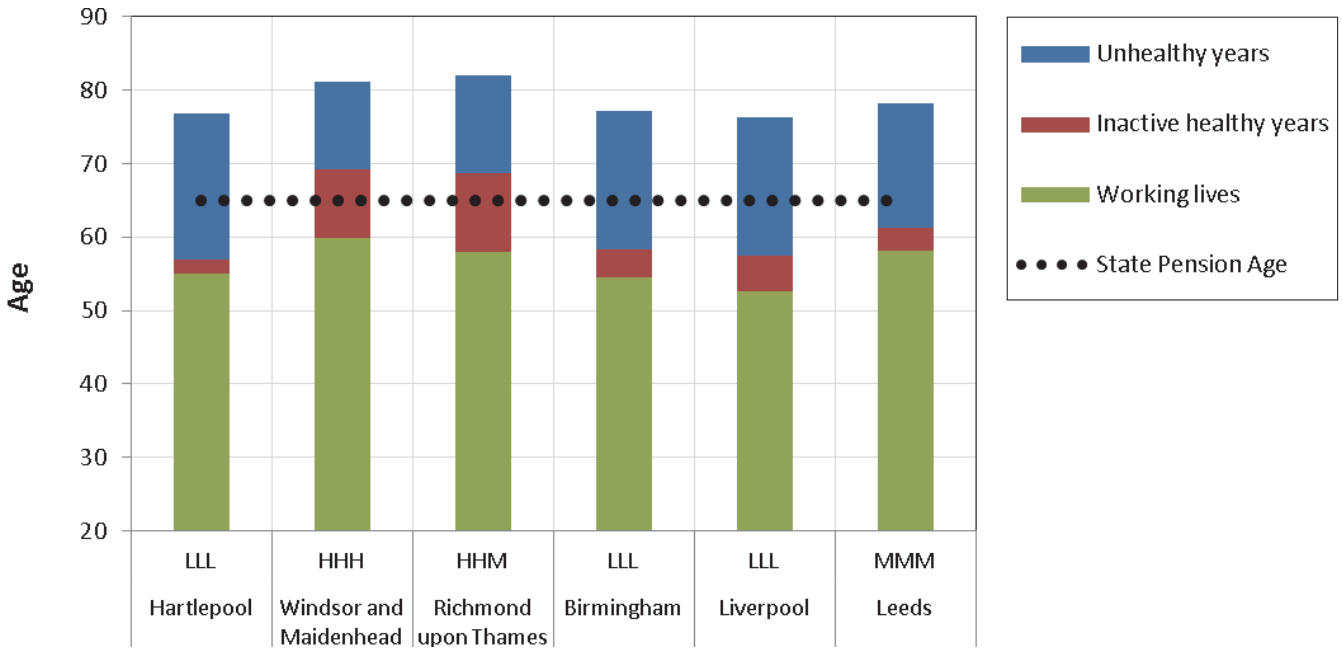


The map in figure 3 shows the tax rates by individual district: the darker the colour, the higher the hypothetical tax rate applying. The values range from 21-22% (cream) to 33-34% (dark green). Prominent clusters of imputed high tax rates are the north-east (cells F3 to H3), north-west (E5 to F6), West and South Yorkshire (G6 to H6), Nottinghamshire (H6 to H7), West Midlands (F8 to G8), Hull (I5), Isle of Wight (G12 to H12) and parts of central and east London (see map inset). There are also sporadic clusters elsewhere such as Plymouth (C13), Telford (F8) and Stoke-on-Trent (F7). For the most part, these tend to be in or near urban areas, though sometimes they are on the coast. If it were available, more granular data would be able to pinpoint

sub-districts better. But, in general, the map gives a good picture of deprivation.

Figure 4 shows six individual districts from four categories – three in the LLL group, and one each from MMM, HHM and HHH. It shows average periods spent by inhabitants in each state – working lives, inactive healthy years and unhealthy years. (A hatched line from left to right shows the base pension age of 65.) The chart shows, for example, in which districts inhabitants are more likely to reach pension age in good health (Windsor and Maidenhead and Richmond upon Thames), and in which they are not (i.e. the rest). In all cases, the average age at which economic activity ceases is lower than the SPA – and, in the case of Hartlepool, there is hardly any difference between health and work span.

Figure 4: Examples comparing individual districts based on work, health and life-span. The hatched horizontal line shows state pension age.



To summarise, characterising districts on this basis is a powerful way of representing inequalities. This is important for applications in which it would be handy to have such a measure to compare with a dashboard of other outcomes. One common measure for capturing inequality is the standard deviation, which is a measure of dispersion relative to the mean: high value signifies greater inequality and low value the opposite. In our illustration, the mean is 26% and the standard deviation is +/- 3%. If tax rates are distributed normally – which approximately they are – it means that 68% of all values fall within one standard deviation of the mean – in this case 26% +/- 3% i.e. between 23% and 29%. This method is used in a later illustration.

Chapter 4:
Effects of changes in LE, HLE and WLE on public expenditure and GDP

There are several ways to use this analytical framework. Broadly, these entail investigating changes in LE, HLE and WLE and their impact on the imputed tax rate, productivity and the cost of providing pensions and welfare. How will tax rates alter if any or all of these variables change? The framework makes this easy to calculate. Take the impact of a future rise in longevity on tax rates. In this case (and with no other changes), we would expect taxes to increase to pay for pensions and higher spending on health and disability benefits. This is because the years spent in ill health would increase, causing higher health and welfare payments, unless there was a compensating improvement in health span.

Mitigating steps from the Exchequer to avoid tax increases could include a reduction in the value of pensions or benefits, or an increase in the SPA. Regression analysis based on the 150 English districts shows that the impact of a two-year increase in life expectancy with no other changes would increase the average tax rate from 26% to 29%. It would be possible to lower that by increasing the SPA by a whopping seven years, or by reducing the average state pension from around £8,000 to £6,000 a year, or by some combination of the two. This example shows that policies aimed only at extending life without extending health are likely to be expensive and counterproductive – as well as unpopular.

It is true that increases in life expectancy have faltered in recent years, and that immediate prospects for further increases have been negatively affected by the Covid pandemic. However, a two-year increase in life expectancy over the next 15 years is a reasonable working assumption based on past performance. (It is possible that the death toll from Covid 19 may have altered the relationship between LE and HLE, but it is too early to tell from the data.) Clearly, the policy goal of improving HLE by five years speaks directly to the issues addressed in this paper, but current policy does not appear to build from an empirical base. New policies are needed that explicitly draw the link between health, work and economic growth.

As long as rises in life expectancy are accompanied by an increase in HLE, prospects are much better – especially if they create headroom for longer working lives. Empirical evidence suggests that a one-year increase in HLE would translate, on average, into an approximate 4.5 month increase in LE. A one-year rise in HLE would, in turn, generate an increase in WLE of roughly 3.4 months. To achieve the government's five-year aim would be a bigger stretch; it would translate into an approximate 23-month increase in life expectancy and an approximate 17-month increase in WLE, based on current labour market and economic activity data.

Table 4 shows the estimated effect on life and work span, taxes and inequality, contingent on changes to health expectancy. The scenarios show the effect of a change in HLE ranging from -2 to +5 years, with no other changes to framework parameters (such as pension age, health costs or welfare payments). Given an HLE baseline of 62.7 years, the results show that life span increases as expected, but by less than the rise in HLE. WLE also increases, but by less than LE. The net effect is for tax rates to fall, but only slightly. Inequalities are reduced less than taxes, suggesting that improving general levels of health may require more targeted measures in individual districts.

The impact on taxes would be considerably greater if there were accompanying changes in the SPA. For

example, assume that the improvements in HLE in Table 3 were matched by increases in the SPA. A one-year improvement in HLE, along with a one-year increase in the SPA, would reduce the tax rate to 25.3%, a three-year improvement to 23.0% and a five-year improvement to 20.8%. Healthcare costs are predicted to fall pre-SPA, but increase post-SPA as more health costs are shunted forward and re-deployed as end-of-life care. That said, the full benefits of increases in HLE are not all measurable in fiscal terms – healthy, economically inactive older people are more likely to engage in voluntary work and social activities as well as spend more on consumption. That needs to be borne in mind.

Table 4: Illustrative examples of changes in life and work span, tax rates and inequalities from general increases in HLE based on figures from birth

Change in HLE at age 20 (years)	Average age at end of:			Change in LE from baseline	Change in WLE from baseline	Tax%	Inequality (standard deviation +/- %
	LE	HLE	WLE				
-2	78.4	60.7	57.1	-0.8	-0.4	27.67	3.04
-1	78.8	61.7	57.3	-0.4	-0.2	27.03	2.98
Baseline	**79.2**	**62.7**	**57.5**	**0.0**	**0.0**	**26.42**	**2.90**
1	79.6	63.7	57.7	0.4	0.2	25.86	2.80
2	79.9	64.7	57.9	0.8	0.4	25.35	2.69
3	80.3	65.7	58.0	1.1	0.6	24.88	2.59
4	80.7	66.7	58.2	1.5	0.7	24.44	2.49
5	81.1	67.7	58.4	1.9	0.9	24.04	2.40

5.1 Economic activity, productivity and GDP

We have seen that a rise in HLE tends, on its own, to have only a modest effect on work span and, therefore, on tax rates, without accompanying fiscal measures (such as increasing the SPA), which would reduce pension costs and taxes by greater amounts. For increases in HLE to have a more substantial effect, especially on output, there would need to be incentives to convert more of the extra healthy years into work. Sluggish productivity growth and early retirement have long been seen as the Achilles's heel of the UK economy and are a priority for review. An increase in HLE can be viewed as a kind of enabler to capture the higher productivity potential of experienced older people who would like to work for longer.

The same sort of analysis can be applied to GDP – defined as the final value of the goods and services produced during a specified period of time, normally a year.

The GDP growth rate is an important summary measure of how well an economy is performing. It can be split into two components – one generated by earnings and the other representing income generated by profits, dividends and rents. Assuming GDP is represented only by wages and salaries, we have the further identity:

GDP= Proportion of adults in work x average earnings x adult population

The first term on the right is another way of expressing work span and equates to levels of economic activity; the second term is a measure of productivity; and the third term is related to life expectancy in a steady state population. For GDP to increase, one or more terms to the right must also increase – for example, a 10% increase in productivity without any other changes would raise GDP by 10%. The same applies to increases in the proportion of the population in work and in the size of the adult population.

GDP per capita is a measure of economic well-being and is found by dividing both sides of the equation by the adult population. It implies that the population becomes better off the higher the proportion of adults that are in work and the higher productivity is. This is a gross figure before taxes are levied, and the imputed tax rates rise with the cost of welfare, healthcare and pensions. The tax rate is determined as follows:

Tax rate = Total cost of health, welfare and pensions ÷ total value of output

The relationship is, therefore, one in which output per capita depends on work span and productivity, but in which net earnings depend on the cost of healthcare, welfare and pensions – all of which are met through taxes as set out above.

Putting the above into context, assume that two thirds of adult life is spent in work and that annual earnings are £25,000, plus 20% employer's social contributions. With an adult population of 50m people this produces a reasonably accurate value of the share of labour in UK GDP of around £1 trillion. The second component of GDP, based on profits, dividends and rents, has remained relatively steady since 2000 at around 50%, which implies a total GDP of £2 trillion, close to the 2020 value of £2.1 trillion according to the ONS. This correspondence means that our demographic accounting framework can be considered reasonably realistic. The key point is that by making each local area accountable for its own taxes, we are now able to shine a spotlight on the cost of inequality.

Conclusions

There is intense interest in tackling the scourge of inequality in society and closing the gap between richest and poorest areas in terms of income, health, housing, education and job prospects. It is increasingly accepted that narrowing the current discrepancy in healthy life expectancy is a necessary step forward. This is a tough challenge and, if anything, the gaps are growing wider. At the moment, all these considerations – work, health, pensions and welfare – subsist in different policy silos. Thus, it is hard to calculate the effect of one on another. For example, what would be the economic value of a one-year increase in HLE on GDP versus a one-year increase in LE? Would this increase or decrease inequalities?

The aim of this research has been to put a price on inequality and an economic value on good health. This has two implications – the first is that good health is a precondition for a longer working life and healthy retirement, and the second is that good health reduces the cost of services such as health and social care. If each district is treated as autonomous and responsible for funding its own health, welfare and pension provision, we can quantify these effects explicitly. Those districts with the fewest working years would pay most taxes and those with the best health and longest working lives the least. Based on simple assumptions we estimated the national average hypothetical tax rate to be 26% of earnings, but this varied by 10 percentage points between the richest and poorest areas, demonstrating the way in which some districts subsidise others through fiscal transfers.

The results show consistently that people in areas with the lowest LE spend more years, on average, in poor health than areas with higher LE. Areas with the lowest WLE also have the lowest HLE, meaning that poor health is likely to be the biggest obstacle to working longer. Such areas enjoy far less time spent in healthy retirement than healthier districts, and they face more health challenges and income deprivation in later years. Healthier areas gain from more social capital – for instance for the purposes of volunteering or caring for relatives – as well as offering inhabitants the flexibility to work up to and beyond the SPA.[11] Areas with fewer years spent in good health show more people needing social care as well as healthcare and financial support. This exacerbates labour shortages in the care sector.

Overall, the analysis suggests that good health is a necessary (although not sufficient) condition for reducing inequality. We show that improvements in HLE translate into longer working lives and also longer life expectancy. A one-year increase in HLE would lead to an approximate 3.4-month increase in WLE and a 4.5-month increase in LE. The increase in HLE should result in more retirement years spent in good health, a smaller gap between HLE and LE and hence reduced demand for health and social care.

However, the impact on inequality does not change pro rata. Therefore, more targeted methods are needed to address the most left behind areas. Still, there would be more healthy retirees than previously, which would be better for the economy and contribute to other beneficial activities such as volunteering and caring.

To address the potentially negative link between an ageing population and economic sustainability three actions are needed:

11 Mayhew, L. D. 2020.On the Postponement of Increases in State Pension Age through Health Improvement and Active Ageing. Appl. Spatial Analysis. https://doi.org/10.1007/s12061-020-09359-y

- Encourage (and enable) more people to work for longer. An increase in the SPA could achieve this but a precondition is that health must improve, not just LE. If the SPA increases and health is unchanged, any saving will be diluted by the increased costs of health and welfare.[12]
- Some of the extra years spent in good health need to be translated into productive work, but this does not have to mean working in arduous occupations or full time. The effects would be beneficial for both GDP and the tax take.
- Lift historically low levels of productivity in the UK, as compared with international competitors, by increasing output per worker through investment in modern production methods, skills training and technical innovation – all of which would translate into higher earnings.

Further implications and prospects

Higher returns on investment through profits, dividends and rents would also boost GDP, so the country as a whole would be better off. This would have the effect of reducing tax rates but not necessarily inequality. That would depend on how the extra output is distributed between areas and, by extension, socio-economically. For example, automation could dispense with some labour altogether. Without any changes in WLE, HLE and LE nationally and locally, the effect would tend to be to concentrate wealth rather than disperse it. The challenge is, therefore, to blend these different levers to optimal effect to achieve the greatest prosperity for the greatest number.

How is it possible that areas with the lowest LE could rise to the level of the highest? We have noted that for HLE to increase by five years by 2035 (which is the government target), life expectancy would rise by about two years to 81.7 years – a level currently reached in only 5% of English districts. In some other countries there is evidence of progress, but not on this scale. Of the G20 countries, only South Korea, India and Russia improved their HLE by more than five years between 2000 and 2015 – and all started from a much lower base. In the UK, the increase was only 2.9 years and in Japan, the country with the world's highest HLE, it was 2.3 years.[13] Closing the gap will be a long-term process requiring locally targeted, as well as universal, adjustments in policies.

What are the immediate prospects? Improvements in life expectancy since 2010 have faltered for various reasons and it has proved challenging to turn this around. The data on the full impact of Covid-19 on LE, HLE and WLE will not be available for a year or two, but we should expect falls in LE. We know from other research that there is a strong relationship between health and deprivation in the UK and that the health gap between the richest and poorest is widening.[14] We also know there are limitations on how long people can be expected to work, as well as affordability problems (from a public spending point of view) regarding the future of the state pension.[15] The achievement of the government's five-year health improvement target depends on unprecedented progress being made in HLE.

While our research has been preliminary, its distinguishing feature is to link human capital and health directly to economic output. It ties together variables that are generally reported in silos. Further research is needed to add local detail – for example, in terms of earnings, gender and the health benefits of education. GDP per head could also be disaggregated using local GDP and the latest demographic data. And, of course, the paper has concentrated on England, and the research could be extended to the whole of the UK.

We urge the new Office for Health Promotion to support joined-up research of this kind by working with bodies promoting productivity improvements and other parts of the 'levelling up' agenda.

13 Health matters: Why we must commit to delivering prevention in an ageing world. 2021. International Longevity Centre (ILC-UK) https://ilcuk.org.uk/wp-content/uploads/2021/02/ILC-HEALTH-MATTERS-RPT.pdf)
14 Mayhew, L.D., G. Harper, G. and A.M. Villegas (2020). Ibid, p3.
15 Mayhew, L.D (2018). Ibid, p6.

Appendix: English districts coded according to life, health and work expectancy (H = high; M= medium; L=low)

No	District	code
1	Barking and Dagenham	LLM
2	Barnet	HHM
3	Barnsley	LLM
4	Bath and North East Somerset	HMM
5	Bedford	MHH
6	Bexley	MHH
7	Birmingham	LLL
8	Blackburn with Darwen	LLL
9	Blackpool	LLL
10	Bolton	MMM
11	Bournemouth	MML
12	Bracknell Forest	HHH
13	Bradford	LMM
14	Brent	MMM
15	Brighton and Hove	MML
16	Bristol, City of	MLM
17	Bromley	HHH
18	Buckinghamshire	HHH
19	Bury	LMM
20	Calderdale	MMM
21	Cambridgeshire	HHH
22	Camden	HML
23	Central Bedfordshire	HMH
24	Cheshire East	MHM
25	Cheshire West and Chester	MHM
26	Cornwall	MMM
27	County Durham	MLL
28	Coventry	MML
29	Croydon	HMM
30	Cumbria	MMM
31	Darlington	LMM
32	Derby	LMH
33	Derbyshire	MMM
34	Devon	MMM
35	Doncaster	LLM
36	Dorset	HHH
37	Dudley	MMM
38	Ealing	HMH

No	District	code
39	East Riding of Yorkshire	MMM
40	East Sussex	MMM
41	Enfield	MHM
42	Essex	MHH
43	Gateshead	LLM
44	Gloucestershire	MHH
45	Greenwich	MMM
46	Hackney	MLL
47	Halton	LMM
48	Hammersmith and Fulham	MMM
49	Hampshire	HHH
50	Haringey	MMM
51	Harrow	HHH
52	Hartlepool	LLL
53	Havering	MHM
54	Herefordshire, County of	HHM
55	Hertfordshire	HMH
56	Hillingdon	HHH
57	Hounslow	MMH
58	Isle of Wight	MML
59	Islington	MMM
60	Kensington and Chelsea	HHL
61	Kent	MMM
62	Kingston upon Hull, City of	LLL
63	Kingston upon Thames	HHM
64	Kirklees	MML
65	Knowsley	LLL
66	Lambeth	MLH
67	Lancashire	MML
68	Leeds	MMM
69	Leicester	LLL
70	Leicestershire	HMM
71	Lewisham	MMM
72	Lincolnshire	MMH
73	Liverpool	LLL
74	Luton	MMM
75	Manchester	LLL
76	Medway	MMM

No	District	code
77	Merton	HMH
78	Middlesbrough	LLL
79	Milton Keynes	MMM
80	Newcastle upon Tyne	LLL
81	Newham	MMM
82	Norfolk	MMM
83	North East Lincolnshire	LMM
84	North Lincolnshire	MML
85	North Somerset	HHM
86	North Tyneside	LMM
87	North Yorkshire	HHM
88	Northamptonshire	MHH
89	Northumberland	MMM
90	Nottingham	LLL
91	Nottinghamshire	MML
92	Oldham	LML
93	Oxfordshire	HHH
94	Peterborough	MMM
95	Plymouth	MLM
96	Poole	HHM
97	Portsmouth	LML
98	Reading	MHM
99	Redbridge	HMM
100	Redcar and Cleveland	MLL
101	Richmond upon Thames	HHM
102	Rochdale	LLL
103	Rotherham	MLM
104	Rutland	HHH
105	Salford	LLM
106	Sandwell	LLM
107	Sefton	MML
108	Sheffield	MLM
109	Shropshire	MMH
110	Slough	MMH
111	Solihull	HML
112	Somerset	MHH
113	South Gloucestershire	HHH

No	District	code
114	South Tyneside	LLM
115	Southampton	MMM
116	Southend-on-Sea	MMM
117	Southwark	MMM
118	St. Helens	LLL
119	Staffordshire	MMM
120	Stockport	MMH
121	Stockton-on-Tees	MMM
122	Stoke-on-Trent	LML
123	Suffolk	HMM
124	Sunderland	LLL
125	Surrey	HHM
126	Sutton	HMH
127	Swindon	MMH
128	Tameside	LLL
129	Telford and Wrekin	MLM
130	Thurrock	MMM
131	Torbay	MMM
132	Tower Hamlets	MLH
133	Trafford	MMH
134	Wakefield	LLM
135	Walsall	LLL
136	Waltham Forest	MLM
137	Wandsworth	MMH
138	Warrington	MHH
139	Warwickshire	MHM
140	West Berkshire	HHH
141	West Sussex	HMM
142	Westminster	HML
143	Wigan	LLM
144	Wiltshire	HMH
145	Windsor and Maidenhead	HHH
146	Wirral	LML
147	Wokingham	HHH
148	Wolverhampton	LLL
149	Worcestershire	MHM
150	York	MHM

About the author

Les Mayhew is head of global research at the International Longevity Centre (ILC), the UK's specialist think tank on the impact of longevity on society, and professor of statistics at The Business School (formerly Cass), City University, London.

His previous experience includes 20 years in the Department of Health and Social Security, the Department of Social Security, HM Treasury and the Office for National Statistics, where he was also a director. He is an alumnus of the International Institute for Applied Systems Analysis (IIASA) in Vienna, and an Honorary Fellow of the Institute of Actuaries.

For most of this time, he has specialised in demographic ageing, health and social care, and pensions. In 2004, he co-authored a book entitled the 'Economic Impacts of Population Ageing in Japan' and in 2010 wrote a commissioned report for the Prime Minister's Strategy Unit on the same subject. As well as authoring research reports for ILC, he has written innovative reports on housing and pensions for the CSFI and on social care for DEMOS. His overseas experience includes spells working in similar areas on projects in Japan, China, Russia, Italy, Ukraine and Australia. He is a member of the steering group for a major project on diabetes funded by the actuarial profession and a member of the scientific advisory committee for The Leibniz Science Campus Ruhr (LSCR) at the University of Essen, focusing on ageing populations.

CSFI Publications

138.	**"The Cost of Inequality – putting a price on health"** By Les Mayhew. July 2021 ISBN 978-1-8381398-2-7	£30/$40/€35 *
137.	**"Banking Banana Skins 2021: The CSFI survey of the risks facing banks"** By David Lascelles. March 2021. ISBN 978-1-8381398-1-0	Free
136.	**"Banked but not Hooked: Young people's attitudes to banking"** A CSFI Report. July 2020 ISBN 978-1-8381398-0-3	Free
135.	**"Too little, too late? Housing for an Ageing Population"** By Professor Les Mayhew. June 2020 ISBN 978-1-9997174-9-0	£30/$40/€35
134.	**"The Digital Currency Revolution"** By David Birch. April 2020 ISBN 978-1-9997174-8-3	Free
133.	**"It's not magic: Weighing the risks of AI in financial services"** By Keyur Patel and Marshall Lincoln. November 2019 ISBN 978-1-9997174-7-6	£25/$45/€35
132.	**"Insurance Banana Skins 2019: The CSFI survey of the risks facing insurers"** By David Lascelles and Keyur Patel. June 2019 ISBN 978-1-9997174-7-6	Free
131.	**"Making the Audit Market Work: the case for liberalising ownership"** By Paul Boyle. April 2019 ISBN 978-1-9997174-6-9	£25/$45/€35
130.	**"The Last-Time Buyer: housing and finance for an ageing society"** By Les Mayhew. February 2019 ISBN 978-1-9997174-5-2	£25/$45/€35
129.	**"Finance for All: Wedded to fintech, for better or worse"** By Keyur Patel and David Lascelles. August 2018 ISBN 978-1-9997174-4-5	Free
128.	**"The Dependency Trap – are we fit enough to face the future?"** By Les Mayhew. January 2018 ISBN 978-1-9997174-3-8	£25/$45/€35
127.	**"A Level Playing Field for Investment Research? Challenges facing the buy-side, sell-side and independents"** By Jane Fuller. October 2017. ISBN 978-1-9997174-2-1	£25/$45/€35
126.	**"Insurance Banana Skins 2017: The CSFI survey of the risks facing insurers"** By David Lascelles and Keyur Patel. May 2017. ISBN 978-1-9997174-1-4	£25/$45/€35
125.	**"From Peer2here: How new-model finance is changing the game for small businesses, investors and regulators"** By Andy Davis. May 2017. ISBN 978-1-9997174-0-7.	£25/$45/€35
124.	**"Reaching The Poor: The intractable nature of financial exclusion in the UK"** A CSFI Report. December 2016. ISBN 978-0-9926329-8-4.	£25/$45/€35
123.	**"Getting Brussels Right: "Best Practice" for City firms in a post-referendum EU"** A CSFI Report. December 2016. ISBN 978-0-9926329-7-7.	£25/$45/€35
122.	**"Financial Services For All: A CSFI 'Banana Skins' survey of the risks in financial inclusion"** By David Lascelles and Keyur Patel. July 2016. ISBN 978-0-9926329-6-0.	Free
121.	**"Banking Banana Skins 2015: The CSFI survey of bank risk"** By David Lascelles and Keyur Patel. December 2015. ISBN 978-0-9926329-8-4.	£25/$45/€35
120.	**"The Death Of Retirement: A CSFI report on innovations in work-based pensions"** By Jane Fuller. July 2015. ISBN 978-0-9926329-9-1.	£25/$45/€35
119.	**"Insurance Banana Skins 2015: the CSFI survey of the risks facing insurers"** By David Lascelles and Keyur Patel. July 2015. ISBN 978-0-9926329-5-3.	£25/$45/€35
118.	**"The City And Brexit: A CSFI survey of the financial services sector's views on Britain and the EU"** April 2015. ISBN 978-0-9926329-4-6.	£25/$45/€35
117.	**"Setting Standards: professional bodies and the financial services sector"** By Keyur Patel. December 2014. ISBN 978-0-9926329-3-9.	£25/$45/€35
116.	**"Financial Innovation: good thing, bad thing? The CSFI at 21"** November 2014.	Free
115.	**"New Directions For Insurance: Implications for financial stability"** By Paul Wright. October 2014. ISBN 978-0-9926329-2-2.	£25/$45/€35
114.	**"Microfinance Banana Skins 2014: Facing reality"** By David Lascelles, Sam Mendelson and Daniel Rozas. July 2014. ISBN 978-0-9926329-1-5.	Free
113.	**"Banking Banana Skins 2014: inching towards recovery"** By David Lascelles and Keyur Patel. May 2014. ISBN 978-0-9926329-0-8.	£25/$45/€35
112.	**"Insurance Banana Skins 2013: the CSFI survey of the risks facing insurers"** By David Lascelles and Keyur Patel. July 2013. ISBN 978-0-9570895-9-4.	£25/$45/€35

* Prices are for hard copies

Supporters

The CSFI is an educational charity. It has no endowment income. It receives financial and other support from a wide range of public and private bodies, as well as from individuals. Among the institutions that have provided the Centre with financial support are:

Accenture
Arbuthnot
Citi
City of London
Deloitte
Fitch Ratings
HSBC
JPMorgan
London Stock Exchange Group
NatWest
Moody's
PwC
Ruffer
Swiss Re

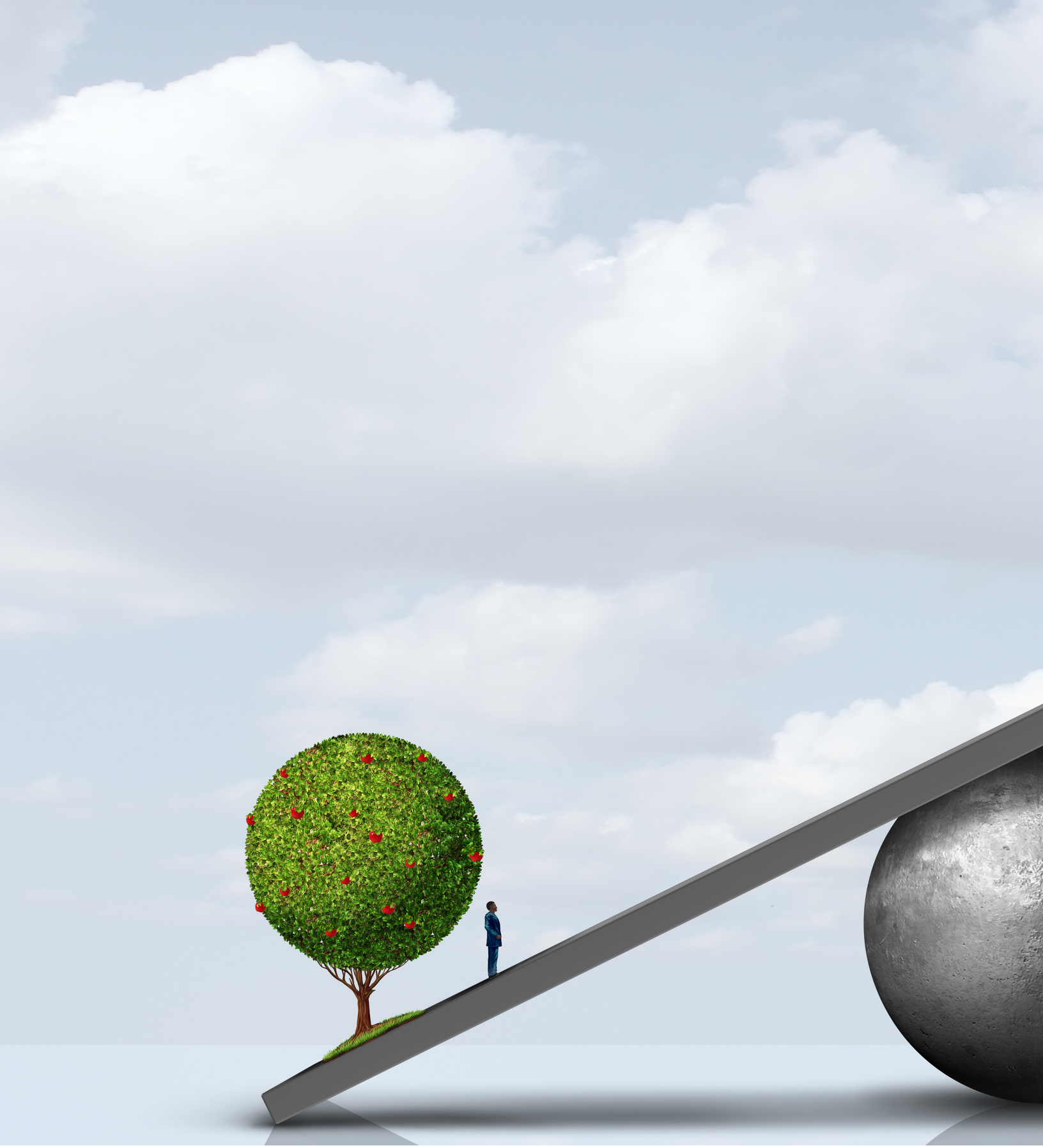
ACCA
Association of British Insurers
Aviva
Bank of England
Bank of Italy
Banking Circle
Building Societies Association
Cognizant
Euroclear
Eversheds Sunderland
Federated Hermes
Financial Conduct Authority
ICMA
IHS Markit
Investment Association
Link Scheme Holdings Ltd
Jersey Finance
Legal & General
Lloyds Banking Group
Meiji Yasuda
Morgan Stanley
Nomura Institute
PIMFA
Record Currency Management
Schroders
UK Finance
Wipro
World Federation of Exchanges

15MB Ltd
3 Lines of Defence Consulting
Absolute Strategy
AFME
Allen & Overy
Association of Corporate Treasurers
Bank of Japan
Brigade Electronics
Chartered Banker Institute
C. Hoare & Co.
CISI
CMS
EBRD
Embassy of Switzerland
Endava
Euro IRP
EVIA
Farrer & Co
Finance & Leasing Association
Greentarget
HM Treasury
Intrinsic Value Investors
Ipsos MORI
Kreab Gavin Anderson
MacDougall Auctions
Meritus Consultants
Money Advice Service
NM Rothschild
OMFIF
Raines & Co
Sapience Communications
Skadden, Arps, Slate Meagher & Flom
Taiwan Financial Supervisory Commission
TheCityUK
Zopa
Z/Yen

The CSFI has also received support in kind from, *inter alia*

Burges Salmon
Charles Russell Speechlys
Clifford Chance
Dentons
DLA Piper
Financial Times
The London Institute of Banking & Finance
Kemp Little
Linklaters
Norton Rose Fulbright

CSFI
Registered Charity Number 1017352
Registered Office: North House, 198 High Street, Tonbridge, Kent TN9 1BE
Registered in England and Wales limited by guarantee. Number 2788116



UK £30
US $40
EUR €35