
مركز محمد بن راشد
للابتكار الحكومي
MOHAMMED BIN RASHID CENTRE
FOR GOVERNMENT INNOVATION
Anticipatory
Public Budgeting
Adapting public finance for
the challenges of the 21st century
A publication by the Global Innovation Council

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Info@pmo.gov.ae

About the Project

The publication has been produced as part of the work of the Global Innovation Council. The Global Innovation Council is a platform for seeking and testing radical alternatives for how governments operate. The council is funded by the Mohammed Bin Rashid Centre for Government Innovation (MBRCGI). This publication describes how public finance could be better adapted to long-term strategy. It is aimed at a global audience to help accelerate thinking and action.

The Mohammed Bin Rashid Centre for Government Innovation was established to stimulate and enrich the culture of innovation within the government sector through the development of an integrated innovation framework.The goal is for innovation to become one of the key pillars of the UAE government in line with the vision of H.H. Sheikh Mohammed Bin Rashid AlMaktoum, UAE Vice President, Prime Minister and Ruler of Dubai, which aims to develop government operations and enhance the UAE's competitiveness, making the UAE one of the most innovative governments around the world.

This publication was written as a collaboration between Sir Geoff Mulgan and Demos Helsinki. Geoff Mulgan is Professor of Collective Intelligence, Public Policy and Social Innovation at University College London and a member of the Global Innovation Council. From 2011-2019 he was Chief Executive of the National Endowment for Science Technology and the Arts (NESTA) and Visiting Professor at University College London, the London School of Economics, and the University of Melbourne. Before that he was head of policy in the UK Prime Minister's office and director of the government Strategy Unit. Demos Helsinki is a Nordic think tank that works towards fair and sustainable societies. The organisation specialises in governance innovation and helps governments in seizing the opportunities of the 21st Century.

Authors
Geoff Mulgan
Silva Mertsola
Mikael Sokero
Juha Leppänen
Mikko Annala
Damiano Cerrone

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Executive Summary

21ST CENTURY GOVERNMENTS face many complex, difficult and long-term challenges: from handling demographic transitions to climate change, navigating the fourth industrial revolution to managing pensions. But while these challenges require long-term action, many of the methods used by governments are very short-term.

One key field where this is the case is public finance. Governments have very limited feedback on the results achieved by spending, which makes it harder for governments to learn; they lack good methods for mapping the long-term impacts of key areas of spending; and they lack ways of mapping and measuring intangible values of all kinds, even though these are essential to economic growth and societal progress.

At present, only physical infrastructure investments are appraised using rigorous investment methods – i.e. by analysing the link between present day costs and long term returns from buildings, roads, airports etc. Yet people now often last longer than infrastructures. For example, for children born in 2020, the average life-expectancy in OECD countries is over 80.[1] Public finance currently supports people - in health, education and other fields - through annual budgets, with few systematic methods to assess the long-term return on investment.

The COVID-19 crisis has dramatically disrupted public spending plans in many countries across the world, with massive spending to maintain incomes, support businesses and finance health. Time horizons have shrunk back, and governments have had to prioritise coping with the crisis.

However, as the world emerges from the crisis it will be more important than ever to think and act long-term if the recovery is to be strong and sustainable. During 2020 there was little space to think hard about the long-term. But in 2021 this will become a priority.

There are countries that are committed to very long term plans, including Japan[2], Singapore and the UAE[3], and both SDG financing arrangements and climate change agreements commit many countries to actions and investments designed to achieve impacts many decades into the future. There has also been significant progress in applying investment methods to social and environmental goals through the rise of impact investment.

This publication aims to help governments align their financing decisions with their longer term strategic objectives, and to address the imbalance between their long-term goals and their usually short-term financial tools.

OUR AIM IS TO ENCOURAGE A SHIFT IN PUBLIC FINANCE TOWARDS:

- more comprehensive and holistic methods (i.e. whole systems approaches);
- longer time horizons where appropriate; and
- more transparency and intelligence built into the design of allocations and monitoring of results.

THE PAPER COVERS:

- Why models of Anticipatory Public Budgeting (APB) are needed, and why current approaches are often inefficient;
- How recent initiatives around the world can be built on, from 'whole of government' approaches to impact investment and 'phenomenon-based budgeting';
- The key elements of APB approaches, including their relevance to the more familiar space of long-term fiscal sustainability and how to integrate investment approaches into key areas of spending, in particular education, health, R&D, including analysis of returns on investment.

THE PAPER SHOWS THE IMPORTANCE OF ALIGNING THESE WITH KEY ELEMENTS OF NATIONAL STRATEGY THAT INVOLVE LONG TIME HORIZONS, SUCH AS:

- Diversification away from oil and industrial strategy;
- Climate change and moving to net zero;
- The handling of both negative risks (such as pandemics) and positive risks (such as new technological opportunities).

THE PAPER THEN LOOKS AT OPTIONS FOR MOVING IN THIS DIRECTION, SHOWING:

- How centres of government could deploy resources more like investments - with allocations to departments linked to prospective impacts or savings;
- How to use data to improve feedback, analysis and learning;
- How to deepen an investment approach in particular fields, with human capital as a good example.

Finally, we offer a brief picture of what public budgeting and finance could look like in 10-20 years time, embedding APB methods and making use of the best available tools and technologies.

An annex explores some of the background issues, including the theory of discount rates and how these should be applied, and how more data-driven approaches to finance could enable more use of AI in the future to speed up learning.

Introduction

21ST CENTURY GOVERNMENTS need to address many complex, difficult and long-term challenges. They range from handling demographic transitions to climate change, from navigating the fourth industrial revolution to managing pensions.

But while these challenges require long-term action, many of the methods used by governments are very short-term. Governments have been criticised for being biased towards the present and lacking tools, methods, approaches and institutional settings to govern sufficiently for the long term.[4] One key field where this is the case is public budgeting, which has yet to adapt to many of the tasks of modern government, with relatively little innovation in recent years.

At present only physical infrastructure investments are generally appraised using investment methods – i.e. by analysing the link between present day costs and long term returns from buildings, roads and airports. Although some governments use cost-benefit analysis methods for assessing some individual policies and programmes (particularly in transport) these are usually much less comprehensive than the methods used for physical investment.[5]

Yet today people last longer than infrastructures - life expectancy in OECD-countries is over 80[6]. As public finance heavily supports people - in health, education, and other fields - through annual budgets, there is a lack of systematic methods to assess and anticipate the long-term return on investment.

Anticipatory Public Budgeting (APB) refers to planning budget allocations with a view to the long-term and then ensuring systematic and anticipatory assessment of their impacts. This depends on new methods and mechanisms, as well as adoption of some emerging good practices. The approach we recommend is experimental - testing out new methods initially on a small scale in order to learn new capabilities while also developing new approaches to data that will make new methods much more impactful in the future.

This Anticipatory Public Budgeting approach takes some inspiration from the success of the New Zealand government in promoting their wellbeing budget.[7] This was as much a success of communication as of technical detail – but its broad direction captured peoples' imagination around the world, and it is being followed up with more serious technical work to link allocations to impacts on wellbeing.

The COVID-19 crisis has made it hard for governments to advance new methods of this kind. More than any recent event it dramatically disrupted public spending plans in many countries across the world, with massive spending to maintain incomes, support businesses and finance health. Time horizons have shrunk back, and governments have had to prioritise coping with the crisis.

However, as the world emerges from the crisis it will be more important than ever to think and act long-term if the recovery is to be strong and sustainable. This is why we are publishing this draft now - to contribute to the work of governments around the world that aim to use recovery from the crisis to address deeper challenges in their societies and economies, and break free from the tyranny of immediate pressures.

THE UAE GOVERNMENT IS LOOKING 50 YEARS AHEAD – ANTICIPATORY PUBLIC FINANCE IS THE NEXT STEP

The UAE Government has taken a long view by focusing on strategies leading towards its centenary in 2071. This 50-year vision opens a window of opportunity to start introducing innovative and state-of-the-art mechanisms that support the government's efforts to achieve it's long-term goals. Preemptiveness and anticipation are nothing new in the UAE – several approaches have been in place for quite some time, including but not limited to more systematic use of futures and foresight methods; more help for the public to plan their own longer lives, from pensions to careers to family and learning; and better links between public policies and long-term global goals such as carbon reduction. We are committed to develop a robust approach to public finance, which is better able to support us in reaching our ambitious goals.

Over the last four decades, public budgeting in the UAE has developed significantly. During this time the UAE's budget has increased 242-fold - an accomplishment which can be accredited to continuous development of budgeting principles and practices. In 2001, the UAE moved from 'Line Item Budget' to 'Programme and Performance-based Budgeting'. This was further iterated in 2008, as a medium-term (three-year) budget was implemented. The medium-term budgeting was made zero-based in 2011. In 2014, a classification of the functions of government (COFOG) and an automated system were implemented. Most recently, a five-year zero-based budget was adopted for the term 2017 - 2021. Today, the UAE federal budgeting process consists of five phases; planning, preparation, reviewing, approval, and execution. Budget expenses and allocations are distributed to the six following sectors: social development, social benefits, infrastructure and economic resources, government affairs, financial assets and investments, and other federal expenses.

The UAE has proved capable of adjusting its practices when societal developments have required new approaches. Currently the UAE is faced with challenges that require rethinking of public budgeting. Here we briefly mention two, which are likely to form an important part of the debate around anticipatory public budgeting.

The first relates to the UAE's overall imperative of diversifying the economy. Substantial changes in the oil market seem inevitable, as we are moving towards what has been called "the age of oil abundance." In 2019, the UAE accounted for around 4% of the world's oil production, and its oil and gas output accounts for roughly 30% of the country's GDP. In the light of these facts, the country has acknowledged the need to diversify its economy away from oil. Diversifying the UAE economy away from oil demands long-term policies, which take future generations into account. Substantial and swift fiscal adjustments are needed as the country wishes to preserve its wealth for future generations. More gradual adaptation will make today's decisions easier - but at the expense of intergenerational equity. Foreseeing and preparing for what the future may hold will be crucial for the UAE. According to multiple scenarios, a diversification away from oil will require a greater emphasis on intangible assets, such as research and knowledge, and on human capital. Thus, the strategy for diversification has to shift

its attention away from the primacy of physical infrastructure. What must be emphasized is infrastructure and investments that support the capabilities of people, as this enables economic growth in non resource sectors. To ensure investments in intangibles and human capital, the UAE must have tools that allow them to assess potential returns on investment in these sectors.

Second, Along with 189 other countries, the UAE has ratified the Paris Agreement, which implies multi-decade strategies to cut carbon emissions. The country has pledged to be in the frontline of global efforts to prove that economic growth and sustainability can go hand in hand. Reaching this requires climate-proofing the country's economy and infrastructure, and ensuring environmental and societal resilience. A part of these efforts is increasing the share of clean energy in the total energy mix from 25 per cent to 50 per cent by 2050. However it is currently expected that the emissions of the UAE will keep increasing at least until 2030. Tackling climate change requires rapid actions and long-term commitment, and is bound to involve a significant role for government in regulation, public investment and design of economic incentives. Governments face many practical challenges in designing and implementing very long-term strategies in line with the Paris agreement. They need to better measure the economic costs of climate change, which remains a work in progress. They will need fresh ways of thinking about risk (including the risk of significant assets reducing in value because of changes in consumption patterns, sea-level rises etc); new ways of planning their own investments (which need to be robust in the face of likely shifts in global policy); and new ways of steering public behaviour, since such changes may be more costly if they have to be introduced quickly in the future.

Why anticipatory public budgeting is needed?

THE 21ST CENTURY world needs long time horizons as well as agility. Great, long-term global challenges like climate change can only be dealt with over many decades. Populations with expected lifespans in the 90s and even 100s who are planning careers and pensions far into the future are likely to expect that their governments can take an equally long view.

Many institutions do try to take a longer view - families do so in relation to their children; guardians of land, too, try to take a much longer view looking generations into the future; and many businesses in sectors as diverse as oil, mining and pharmaceuticals embark on investments that will only pay off decades into the future.

Some governments do attempt to plan far into the future, whether in relation to social security costs or infrastructure. But most focus primarily on the short-term, a phenomenon that has been called 'presentist bias'.[8]

Some recent developments are helpful to a longer perspective - such as the shift to accrual-based accounting in many governments[9] and introducing 'phenomenon-based' budgeting for complex and cross-sectoral phenomena (e.g. gender, SDGs or children) which don't fit neatly into existing government structures.[10]

But most financial management tools are far shorter term than they should be. Commercial and financial markets are driven by quarterly results, or investment exits within 5 or 10 years. Government mechanisms reflect commercial ones with discount rates that devalue results more than a generation out: typically, discount rates mean that an achievement in 2071 is discounted by more than 80% through the lens of current appraisal methods.

As noted above, governments use longer term appraisal methods for investments in things (or at least some things) but only rarely for investment in people.

Many governments have seen their horizons shrink even more in the last few years as a result of the financial crisis and political weakness that makes it harder to make difficult decisions.

New methods will be particularly vital for countries that are going through profound shifts of strategic direction, and need to ensure that public finance is aligned, for example, to long-term human capital development - a challenge which will play a key part in the diversification of economies and the shift to models of growth that emphasise intangibles as much as tangibles. Our hope is that the kind of detailed analysis that is commonly used to design and appraise pensions systems (including actuarial assessments) will become more normal in other areas of public spending.

The risks of embedded short-termism are summarized in the box below.

DISADVANTAGES OF EXCESSIVELY SHORT-TERM APPROACHES TO BUDGETING:

1. **Undermining the economy**. If a government fails to invest adequately in some of the key building blocks of the 21st century economy (including R&D, intangibles11 and human capital), it will not provide optimal conditions for businesses to innovate and for the economy to grow. The key is the quantity, quality and balance of this intangible investment.

2. **Undermining the life and wellbeing of people**. People often last longer than buildings. If a government does not consider the whole lifespan of its investments, or uses imbalanced appraisal methods, this is likely to be reflected in an imbalance in spending and a failure to provide citizens with the best support for life opportunities. A common pattern is relative over-investment in physical objects - buildings and infrastructures - relative to investment in people.

3. **Failure to handle risk**. Without better methods of appraisal and allocation, governments are likely to underinvest in both taking positive risk (associated with both R&D and business innovation) and anticipating negative risks, with potentially serious consequences for stability and growth.

The key elements of anticipatory public budgeting

IN THIS PUBLICATION we will explore some of the methods needed for budgets to take a longer time horizon (10 to 50 years into the future), and for more systematic learning about how best to allocate resources. Our emphasis on the time horizon of budgets leads us to focus on four clusters of issues:

1. **Budgeting for long-term fiscal sustainability:** this is necessary for all governments and involves attention to future revenues and spending commitments, particularly in fields such as pensions and social security. This is fairly familiar territory and includes addressing government's current and future balance sheets with more rigour.

2. **Integrating investment approaches into key areas of public spending:** in this publication we look at ways of treating key aspects of government spending more as investments with impacts over many decades:

   A. Education, including early childhood as well as primary, secondary, and tertiary education;
   B. Health, including public health as well as provision of services;
   C. Innovation and R&D.

3. **Linking public finance to other key long-term strategies:** with particular reference to 1) long-term economic diversification, 2) climate change, and 3) better ways of handling positive and negative risk. In each case, the key is to ensure that finance aligns with and supports broader strategic objectives, and that there are feedback loops from outcomes to spending decisions.

4. **New policy options and tools to embed Anticipatory Public Budgeting:** here our interest is in innovations in the management of public finance, including new ways of using data and new ways of organising budget allocations which can support the objectives and challenges set out in the previous sections.

Action on all of these fronts would make it more feasible to analyse current spending decisions in terms of their effects - including on balance sheets - in future decades. These areas are described in more detail below.

Budgeting for long-term fiscal sustainability

The best developed aspect of long-term public finance is the analysis of overall fiscal sustainability. In the USA, various bodies - including the Office of Budget Management, the Congressional Budget Office and the General Accounting Office - prepare long-term budget projections (75 years out in the case of the Social Security Administration) to aid decision making.11 The UK's Office for Budget Responsibility comments publicly on the long-term effects of budget decisions - though only taking account of first order effects (i.e. the overall fiscal position rather than the value created by spending in fields like health and education).[12] The OECD has at various times in the past looked at long term budget planning issues.[13, 14]

These all attempt to look at stocks and balance sheets as well as flows. This is complex since governments need to

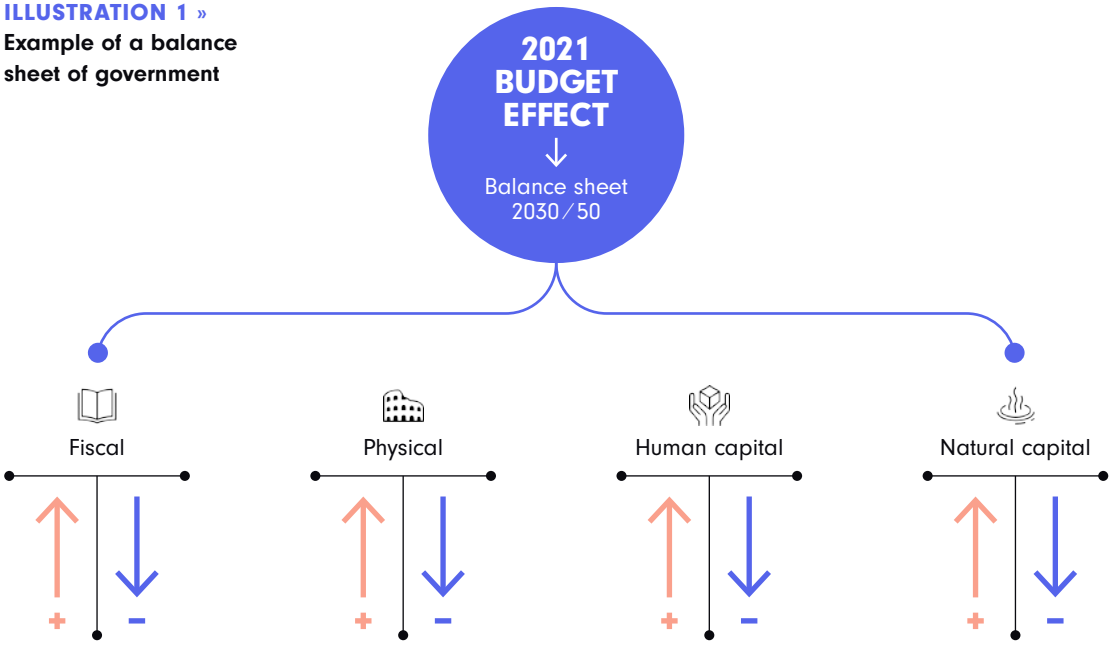
attend not only to their own balance sheet but also to that of the nation as a whole. The key items considered as stocks are usually pensions and other social security spending commitments, rather than other assets and liabilities. Indeed, governments do not generally look at their balance sheet in a wider sense. Few analyse rates of return on the assets they hold (or organise national registers of assets). Even less use is made of intangible measures in the public sector, though these are now routinely measured in the private sector.

Looking to the future, at a minimum governments should measure the value of their physical assets – land and buildings - and pension liabilities. A more sophisticated approach would extend this to other fields, looking at the long-term effects of spending decisions on other aspects of the national balance sheet including human capital and natural capital too.[15]

No countries do this yet, and it is technically challenging. But the IMF has been encouraging governments to take basic balance sheets more seriously, though primarily focusing on quite narrow definitions (i.e. pension liabilities) rather than human or natural capital.[16]

This diagram summarises what might be achievable in time - a mapping of how current spending is likely to affect future balance sheets, including not just the 'classic' balance sheet of government assets and liabilities, but also the state of physical assets, and the state of human and natural capital in the nation as a whole:

ILLUSTRATION 1 »
Example of a balance sheet of government



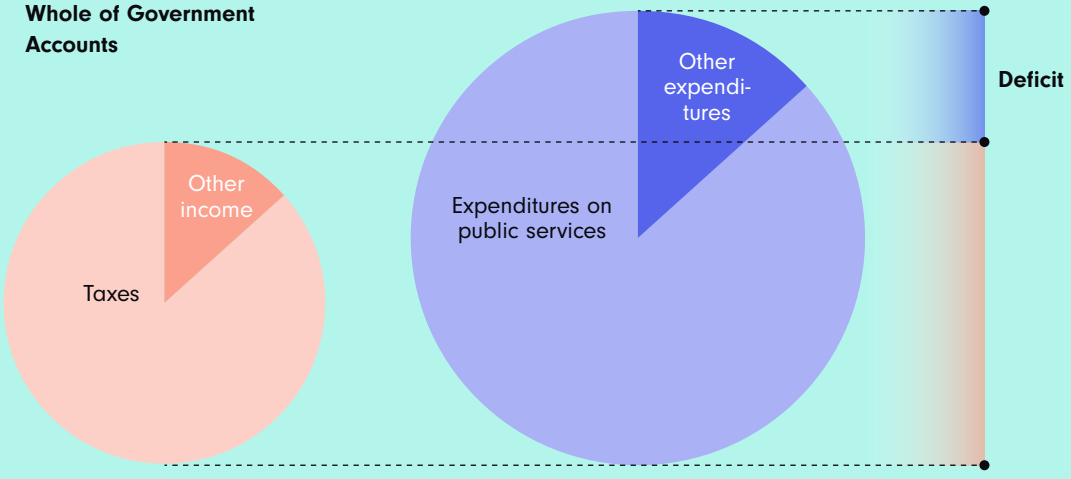
Case 1
THE UK'S WHOLE OF GOVERNMENT ACCOUNTS

The UK publishes a Whole of Government Accounts (WGA) which is a consolidated set of financial statements for the UK public sector. The WGA covers over 8,000 public organizations in the public sector and follows the International Finance Reporting Standards system which the private sector also uses. In addition to bringing transparency and enabling scrutiny, it also supports longer term fiscal analysis.[17]

The WGA is a globally unique publication as it enables the direct comparability of financial data across public sector entities and produces trend data that helps to inform future analysis and decision making. It clarifies a number of metrics that previously have been difficult to calculate, such as the net public service pension liability, the government's commitments under private finance initiative contracts, total provisions, and contingent liabilities. The annual publications of the accounts allows the reader to build up a clear and consistent picture of trends and changes in the government's fiscal position.

The WGA also includes intangible assets. Yet, the International Financial Reporting Standards guidelines that the WGA employs are based on a narrow definition of intangible assets, meaning that intellectual property, data and other assets are not included in the report. Using a wider definition of intangible assets (the so-called 'knowledge assets', including intellectual property, software, data, technological expertise, organisational know-how, and other intellectual resources) would significantly increase the percentage of intangible assets in the public accounts, from the 2017 estimate of around 2% to around 8% of total public sector assets.[18]

ILLUSTRATION 2 »
Whole of Government Accounts



Integrating investment approaches into key sectors of public spending

This section addresses how budgets are organised in some of the fields that are most important for the 10-50 year time horizon. Three of the most important fields in terms of both quantity of spending and strategic importance of impacts are:

1) education and skills
2) health
3) innovation and R&D

Each of these usually involves substantial spending and long-term effects but - at least in most governments - little tracking of the relationship between spending and results.

In each area there is an opportunity to build on several decades of experimentation with the use of outcome-based and performance-based budgeting methods and steady improvements in measurement.

Outcome-based budgets have been fairly successful in fields such as employment, where there is a relatively simple link between actions and results, and with challenge prizes that fund results in R&D in a more open way.[19] Part of their value has been to force greater transparency and precision. While there are big differences between government and business, there are also useful lessons to be learned from the leading edge in business, where outcome-based budgets are common in fields as diverse as aircraft engines and buildings.

The approaches proposed below also build on current use of Cost-Benefit Analysis (CBA). In principle CBA can be extended to almost any field (the French government now applies them to all spending proposals over 20m Euro and they are widely used in many US states).[20] They tend to be used for single policies, and often to assess new ones, rather than assessing whole areas of spending or - as suggested by the phenomenon-based budgeting approach - assessing societal phenomena. There are also many critics of these methods (particularly because they ignore distributional questions).[21] Nonetheless, some of these approaches are relevant to deliberate long-term investment in human development programmes.

Case 2
AUSTRIA'S PERFORMANCE-BASED BUDGETING

In 2009, the Austrian Government launched a budget reform that introduced a new structure with lump-sum budgets for line ministries, allowing more flexibility around in-year reallocations. The reform introduced a performance management tool – 'performance-based budgeting' – that measures budget allocation outcomes.[22]

The objective of the reform was to improve both budgetary decision-making and the design of the federal budget as a comprehensive steering instrument for resources, output and outcomes. Other objectives included incentivizing a disciplined, flexible approach to financial management within line ministries, and promoting a focus on performance and results achieved with public funds.

A performance-based budgeting system includes measurable KPIs for specific policy objectives. The KPIs, together with ministerial autonomy on the lump-sum budget allows quick adaptation to changing circumstances, while the KPIs ensure measurable ways to reach the objectives. Through the reform, Austria simplified its budget structure considerably by: **(1)** limiting the number of budget chapters; **(2)** reducing the number of objectives and indicators per budget chapter (within global budgets and detailed budgets); **(3)** introducing performance mandates; and **(4)** mandating clear and systematic links between (mandatory) ex ante and ex post impact assessments, and the participatory budgeting system. In 2013, Austria started long-term fiscal projections of up to 30 years to provide a long-term perspective on budget planning.[23]

EDUCATION AND SKILLS

The first field where an investment approach is most needed is education, with different issues arising in relation to early childhood, different levels of primary, secondary and tertiary education as well as vocational skills. There is now an extensive literature on the returns on investment in these and the likely balance of rewards for individuals, employers and the government.[24] Research also suggests that public investment in higher education can bring not only economic benefits - when educated individuals earn more and thus pay higher sales, property and income taxes - but also benefits to the individual, ranging from improved health to fewer divorces and more active civic engagements.[25]

The detailed research shows that there is no simple causal link between more spending and better results. Much depends on the quality of implementation; the sequencing[26]; complementary actions[27]; and the paybacks may be very long. More generally, the pay-offs from education depend on the state of the economy: there are many examples of countries with high quality education systems that did not reap the benefits because of a lack of absorptive capacity in the economy.[28] However, similar complexities apply with physical investment.

We recommend work to better integrate this knowledge base with budget allocations, and also look at how it opens up new policy tools that encourage parallel investment by government, business and individuals (for example into learning accounts).

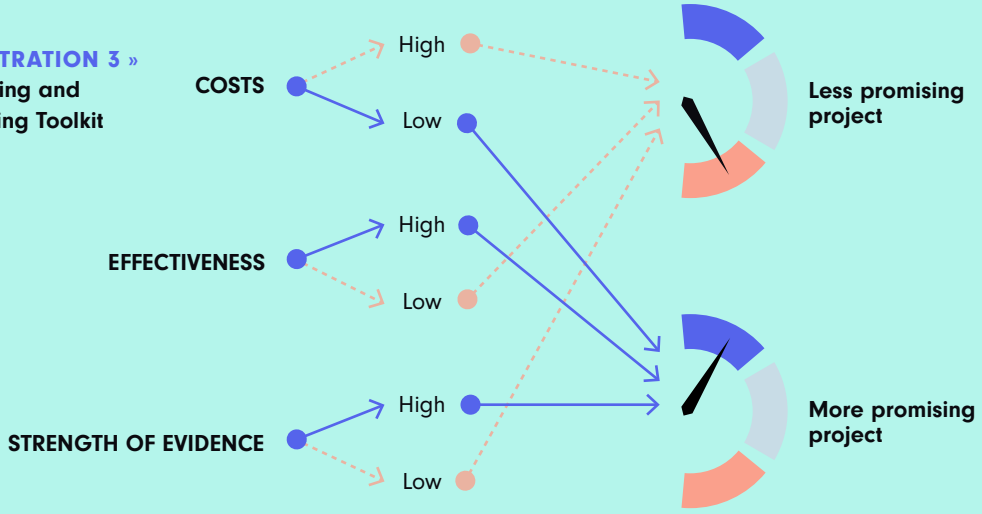
This would also help decision-makers better assess the relative benefits of different spending choices in education when scarce resources must be prioritized. A useful resource is the accumulation of 'what works' repositories of evidence and cost-effectiveness, such as in the example below (now used in Latin America, Australia and the UK). With more systematic tagging of inputs and outcomes achieved, guides of this kind can become ever more useful, and less dependent on one-off research studies.

Case 3
TEACHING AND LEARNING TOOLKIT

The Teaching and Learning Toolkit developed by the Education Endowment Foundation in the UK is a practical toolkit to help educators choose educational interventions and methods based on their impact and cost-effectiveness. The toolkit compiles and presents the latest evidence on 34 different educational interventions and their respective costs - from aspirational interventions, to built environment, to school uniforms. The toolkit also assesses the reliability of the research in the specific interventions.

The Toolkit is designed to support teachers and school leaders who are making decisions about how to improve learning outcomes and simultaneously evaluate cost-efficiency. By compiling latest research results and other relevant information in an understandable and accessible format, the alignment of budget allocations, spending transparency and, most importantly, the quality of measure implementation can be significantly improved.[29]

ILLUSTRATION 3 »
Teaching and Learning Toolkit



HEALTH

Another key sector that would benefit from more rigorous long-term analysis is health. For example, much health spending concentrates towards the end of a person's life. But other types of spending and public health measures often create value that lasts over many decades, driving up life expectancy and healthy life expectancy.[30] The absence of good tools for assessing the impacts of health spending has in many countries fuelled an over-emphasis on cure relative to prevention and costly capital investments over more cost-efficient alternatives. There are examples of integrating behavioural and social sciences' insights into public health management but these have not yet been fully integrated into decision-making.[31]

NICE in the UK assesses the cost-effectiveness of many treatments of all kinds; but it struggles with assessing many public health and behavioral interventions because of the huge skew in research funding, which has overwhelmingly prioritised clinical and pharmaceutical research over research into the social, environmental and behavioural causes of ill-health, even though evidence shows that these explain much more in terms of premature death.[32]

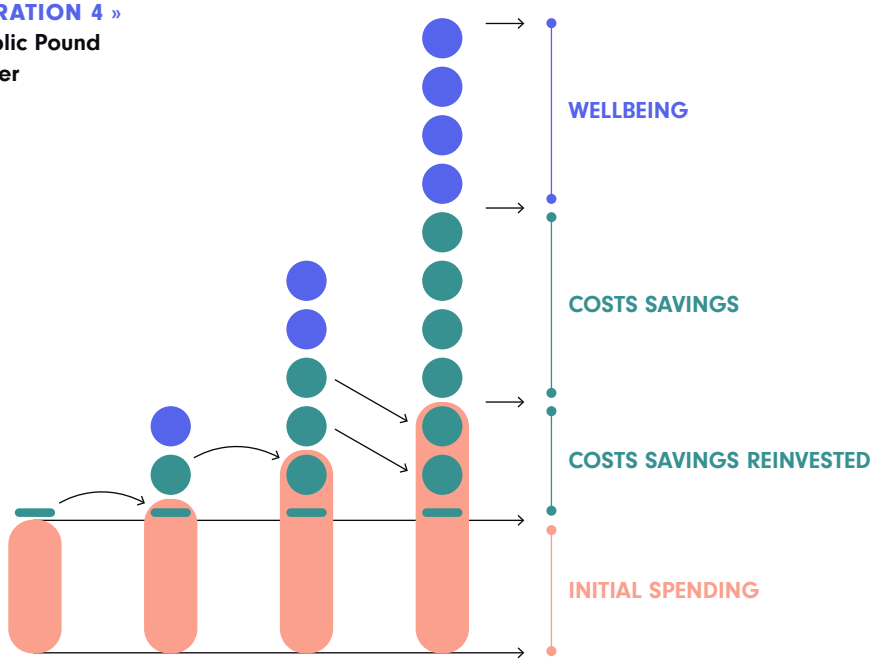
Some governments use new tools that take these human aspects of spending into account: these include Green Books and Magenta Books (used by the UK government and others) to cover spending on people; and work in the impact investment field analysing rates of return on social programmes. But a major shift will be needed in many countries to better define public health and preventive interventions; track their impacts; and link these to spending inputs and effects on health costs. These can show the potential 'multiplier' effects of different types of spending (see Case below).

Case 4
THE PUBLIC POUND MULTIPLIER

In the UK, officials have used the Public Pound Multiplier to showcase how early interventions can in some situations be more efficient than focusing on late interventions. Studies in the UK have found that every £1 invested in providing support for people with alcohol problems saves the public sector £5. Preventative action on smoking is even more cost efficient, with a £1.7 bn savings in return for a £300 million investment. Using this type of a model can showcase cashable savings for the whole government, for individual departments and an overall benefit for society - incentivising investments in healthcare and wellbeing.[33]

A systematic use of public spending multipliers to describe and showcase impacts and cost-benefits of public spending could be used in other areas of government as well, such as crime, education and infrastructure investments. The model improves feedback loops and allows a long-term view on public spending as decision-makers and voters are presented with more accurate costs in the long-term, rather than according to election cycles. The success of an instrument like the Public Pound Multiplier requires flexibly available funds to ensure that the incentives are maintained. The risk is that savings from investment by one agency are recouped by another, resulting in disincentives to invest in early intervention.

ILLUSTRATION 4 »
The Public Pound Multiplier

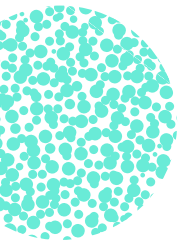


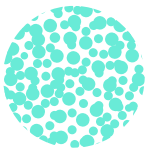
INNOVATION AND R&D

Just as companies invest in R&D with expectations of returns from new products and services, so should the government increasingly link allocations to innovation to potential returns in terms of savings, productivity and the value of improved services (recognising that most of the benefits will be indirect spillovers rather than direct). Again, this is technically very hard to do in detail at present. But some illustrative examples could be used and there are good prospects for improving the techniques available.

Current research on the assessment of innovation and R&D investments lack the granularity to distinguish between the impacts of different types of innovation spending[34] - but we expect this to become increasingly important over the next few decades.

One issue here is that governments are often poor at making decisions about innovation priorities. These are usually passed out to others: decisions on research are delegated to academic peers; decisions on investment are often made by committees with strong representation of business; or decisions are made by empowered individuals (as with bodies like DARPA). Another option is to focus money on matching so as to benefit from the possibly superior decision-making capacity of others. Each of these methods has pros and cons, but what is surprising is how little systematic use is made of data and knowledge, e.g. with explicit articulation of what is intended to be achieved, assessments of probabilities, and then learning from the results achieved over time. The relative lack of feedback makes it hard for systems to learn both from successes and failures.





Case 5
HORIZON 2020 INDICATORS AND MONITORING

Horizon 2020 is the European Union Research and Innovation program that makes over €80 billion available over a seven-year period to drive economic growth and create jobs in Europe. Horizon 2020 is legally required to specify Key Performance Indicators that are used in the evaluation and monitoring of the program's goals. This is the first time that these indicators have been specified at the start of the program, thus enabling continuous evaluation and a clear vision of the desired impact. An annual Monitoring Report is published relying on these indicators. The evaluation aims to explore whether a particular intervention has led to the specified goal and why this has or has not been the case.

In total, there are 23 KPIs ranging from publications in high-impact peer-reviewed journals and patent applications to growth and job creation in participating SMEs. Impact is evaluated on the basis of information provided by participants, third parties or collected through program monitoring. This large amount of information is aggregated and made available for exploitation and analysis by various information technology tools. Different tools are used to monitor different activities. To move away from simply looking at input information and towards reporting on the impact of research and innovation investment, considerable "attention will be paid to information on results to develop a clear picture of the number of completed projects, the fields to which these relate, what they delivered and what steps have been taken regarding exploitation of research results".[35]

Examples of indicators include:

- Publications in peer-reviewed high impact journals;
- Number of researchers who have access to research infrastructures through support from Horizon 2020;
- Percentage of participating firms introducing innovations new to the company or to the market (covering the period of the project plus three years);
- Percentage of participating SMEs introducing innovations new to the company or the market (covering the period of the project plus three years);
- New products, processes, and methods launched into the market.

The last of these indicators is one of several whose goal is developed on the basis of the first results of Horizon 2020, thus enabling the continuous adaptation of the process as new information emerges.

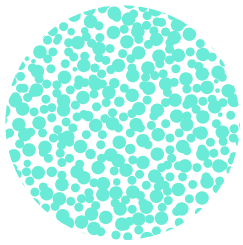
In the new Horizon Europe framework program that will succeed Horizon 2020, these KPIs have been replaced with Key Performance Pathways that allow the evaluation of scientific, societal and economic impact of R&I investments.[36]

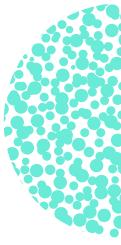
Aligning budgeting for long-term impact with other elements of government strategy

While it is important to address some of the big areas of public spending described above, it is also important to ensure that Anticipatory Public Budgeting aligns with broader challenges faced by many governments in better linking public finance to overall strategy.

A good recent example of aligning long-term strategy and budgeting is New Zealand's Wellbeing Budget which has a strong emphasis on investing in children and in the prevention of mental ill-health.[37] In some countries, various kinds of commission have been set up to provide advice on long-term budget options and priorities, including the Productivity Commissions in Australia and the CPB Bureau for Economic Policy Analysis in the Netherlands.[38] Here we briefly mention three areas of strategy which are likely to form an important part of the debate around 50 year budgets:

1) **diversification of economies,**
2) **climate change, and**
3) **handling positive and negative risk**.





Case 6
THE PUBLIC POUND MULTIPLIER

Since the late '80s, New Zealand has been shifting its public management from emphasizing how much is spent by public institutions to focusing on what it is spent on and why. This outcome- driven social investment approach has aimed to better align budgeting allocations and long-term strategic outcomes.

New Zealand's Wellbeing Budget exemplifies efforts to link budgets more strongly with long-term societal goals. The budget process starts with the government agreeing on Wellbeing Budget priorities, after which ministers must demonstrate how their budget bids would help achieve these priorities. By approaching the budget through wellbeing targets, the Wellbeing Budget successfully shifts the budgetary paradigm from abstract departmental budget allocations to practical, measurable steps towards desired long-term societal visions: ending child poverty, transitioning to a low-carbon economy, and so on, including a significant increase of spending on mental health.

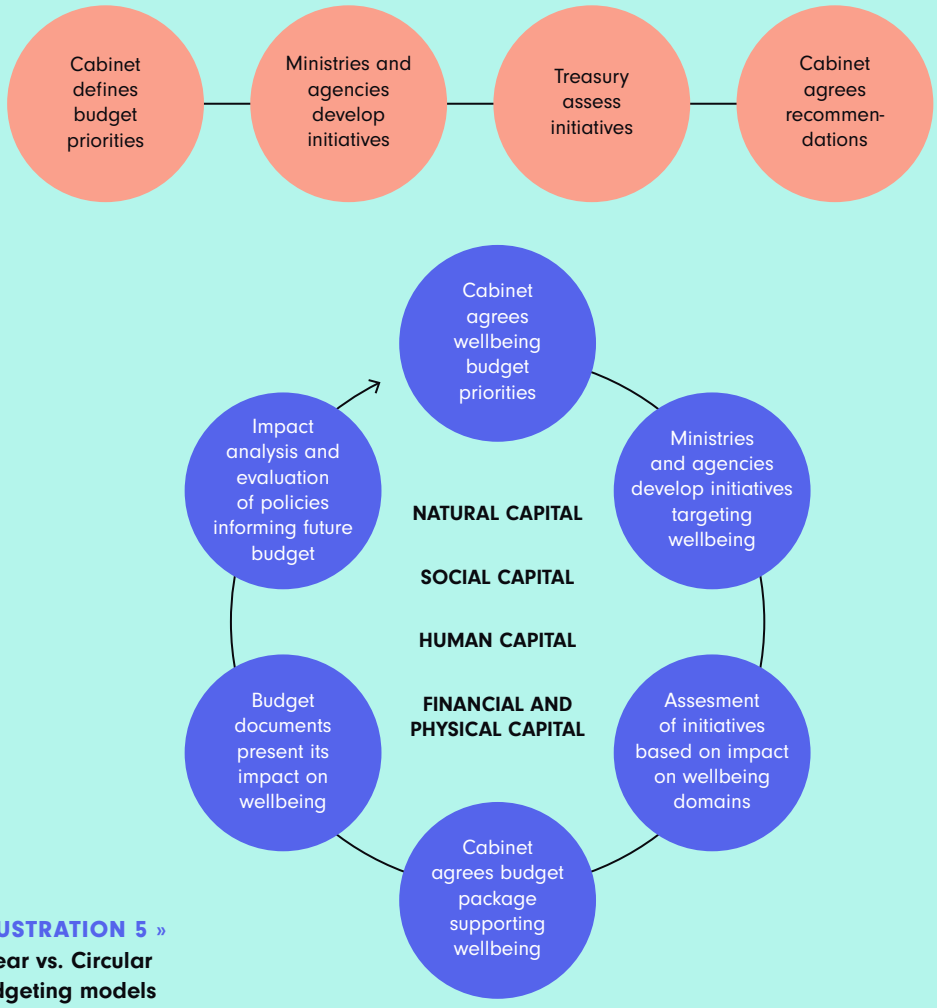


ILLUSTRATION 5 »
Linear vs. Circular budgeting models

DIVERSIFICATION OF ECONOMIES AND INDUSTRIAL STRATEGY

Many countries are seeking to diversify their economies and reduce dependence on particular commodities. All in different ways are seeking to strengthen their more knowledge-intensive sectors and rise up the global division of labour.

This will generally involve a bigger role for intangible investment, whether through universal education, building up universities, and investing in science and technology.[39] Over 90% of science and technology spending currently takes place in the richest economies and China, but many would like to see a more even spread across the world. This requires that industrial strategies will increasingly need to move beyond the primary focus on physical infrastructures - ports, rail, airports - towards investments that support the capabilities of people and intangible assets more generally.[40, 41] As this happens, it will be vital that governments' own methods do not lag behind.

CLIMATE CHANGE

190 countries ratified the Paris Agreement, committing to multi-decade strategies aimed at cutting carbon emissions. Tackling climate change requires rapid actions and long-term commitment, and is bound to involve a significant role for government in regulation, public investment and design of economic incentives. Governments face many practical challenges in designing and implementing very long-term strategies that are in line with the Paris agreement. They need to better measure the economic costs of climate change, which remains a work in progress.[42] They will need fresh ways of thinking about risk (including the risk of significant assets reducing in value because of changes in consumption patterns, sea-level rises, etc.); new ways of planning their own investments (which need to be robust in the face of likely shifts in global policy); and new ways of steering public behaviour, since such changes may be more costly if they have to be introduced quickly in the future. Again, it will be vital that governments' own internal methods are aligned with these long-term goals.

HANDLING POSITIVE AND NEGATIVE RISK

As indicated above, an important task for any government is to have a clear view of both positive and negative risks. Positive risks require a view of how investments in innovation of all kinds - from classic R&D through business innovation to public sector innovation - may contribute to longer-term goals, even though it is very hard to know which individual investments will succeed. Handling negative risks also requires a broad view of their probability and potential impact, as well as investments in the appropriate mitigating actions. These may be relevant to a wide range of risks: from terrorism to climate events, and from pandemics to financial crises. These have a similar structure to some of the issues described above in that they require spending now with uncertain benefits into the future. Although risks cannot be easily quantified, regular exercises to map them and ensure appropriate countermeasures are another vital area where long-term strategy and finance intersect. One side-effect of the COVID-19 crisis is likely to be more systematic attention to big risks and their mitigation.

An overview of where anticipatory approaches and methods could be most valuable

WE SEE FOUR main areas where progress could be made towards Anticipatory Public Budgeting. In each case new methods can be developed alongside mainstream public budgeting processes and then steadily integrated over time.

Aligning budgets with long-term goals and incentivising investment approaches

A first priority for governments is to start reshaping their internal processes to better encourage long-term approaches. This happens to some extent already with capital budgets, where there are expectations of analysis of likely impacts and returns. We recommend that centres of government (in which we include the Ministry of Finance) should also start to link budget allocations to departments with requirements to predict and monitor potential impacts, so as to embed longer time horizons into decision-making.

CREATE AN INVESTMENT BUDGET FOCUSED ONLY ON HIGH IMPACT LONG-TERM ACTIONS (HIGH IMPACT LONG-TERM INVESTMENT FUND)

A first option is to set aside a specific budget for investments that may have a high impact but over a long time horizon (initially, e.g., 2% of total spending) and to encourage some competition for this allocation between departments, encouraging them to show the investment case for, e.g., more investment in specific R&D, education or health programmes. The quantity set aside for the fund could steadily increase year by year (to, e.g., 10% of spending) as the government becomes more capable of identifying spending with the most potential impact in 10, 20 and 50 years. An important side product of such a process would be to generate a great deal of valuable insight into investment impacts and returns.

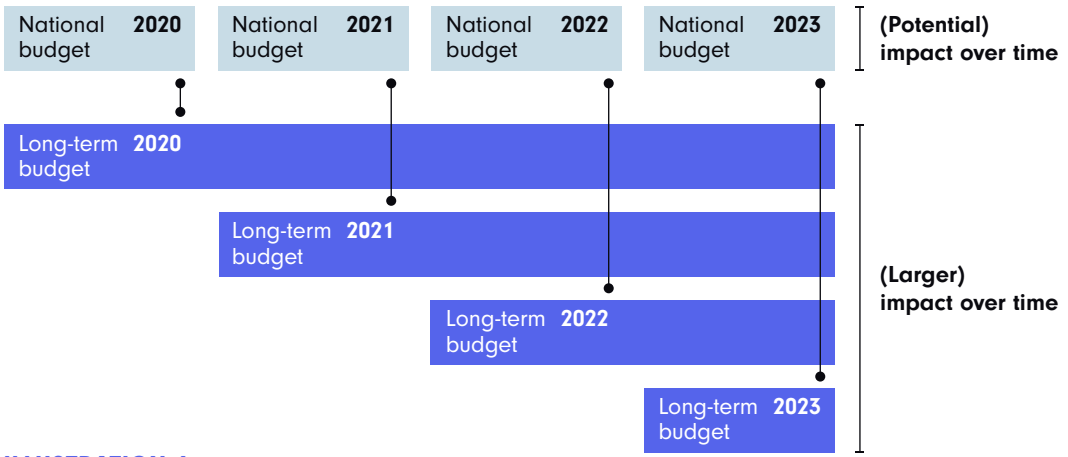


ILLUSTRATION 6 »
How could an investment budget accumulate impacts in the long run?

CREATE CROSS-CUTTING BUDGETS FOR TACKLING CHALLENGES PRE-EMPTIVELY AND SYSTEMICALLY

In parallel we would recommend cross-cutting arrangements, since many of the biggest challenges cut across departmental boundaries. This requires action to build on whole-of-government approaches in budgeting and phenomenon-based budgeting. One option would be to earmark a small number of cross-cutting budgets which would sit above departmental allocations, and then be managed jointly, linked to clear business cases, measurement and assessment of returns. Examples would include: decarbonisation strategy; skills development; and industrial strategy.

Learning and human capital could be a particularly good example. There are now many examples of such horizontal budgets from around the world that can be drawn on.[43]

These can be greatly enhanced through linking them to longitudinal analysis. These are long-term research programmes that track a cohort of people (e.g. several thousand people born in a particular year) to see what happens to their lives. Such longitudinal studies make it easier to analyse the impacts of government spending, such as: tracking inputs of education, health, and training, and then seeing how they correlate with outcomes in terms of jobs, salaries, or health.

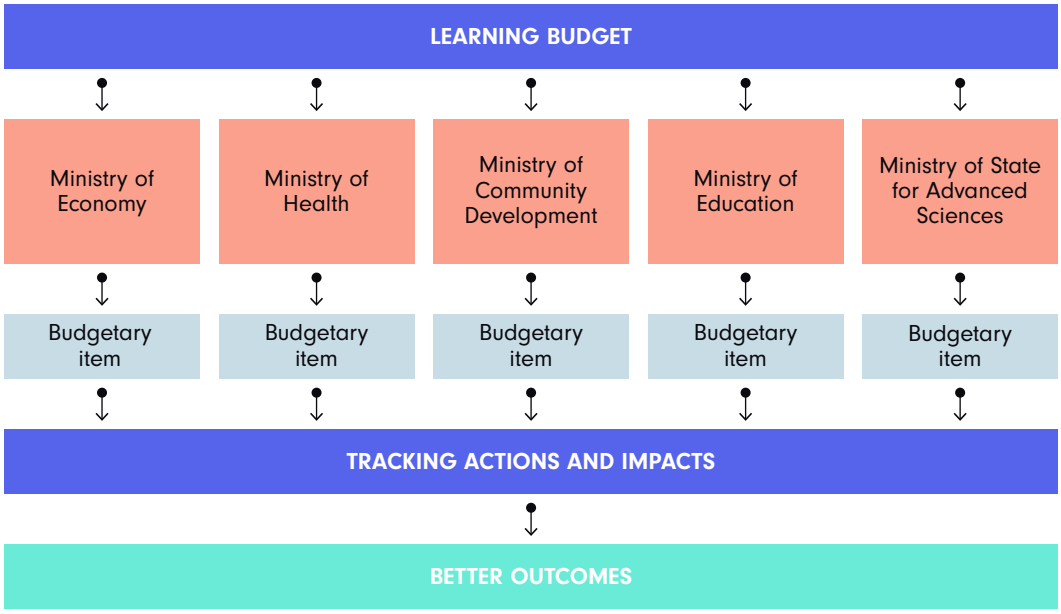


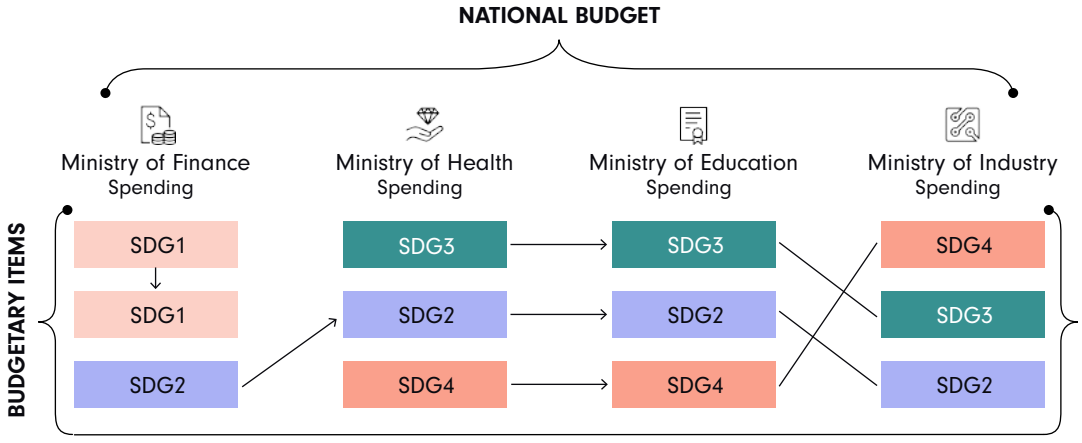
ILLUSTRATION 7 »
Combined budgets illustrated in the context of the budget for learning

Case 7
FINLAND'S PHENOMENON-BASED BUDGETING INITIATIVE

Finland is exploring the adoption of a thematic and cross-sectoral approach to performance management and budgeting based on phenomena (i.e. policy issues not restricted to only one governmental entity) and sustainable development. This is done by tagging all budget allocations that contribute to a phenomenon, which helps the National Audit Office of Finland and the government as a whole, to draw up a coherent picture of what type of phenomena the budget allocations contribute to. Moreover, phenomenon-based budgeting allows mapping and following of how funds are being spent for reaching the goals of Agenda 2030 and the prioritized goals derived from the Agenda, many of which do not follow organizational boundaries of government.

Phenomenon-based budgeting is a method for directing and shedding light on resources to solve broad, cross-departmental problems. It can contribute to heightened transparency and policy coherence, as budget allocations within one phenomenon may contribute to divergent goals.[44]

ILLUSTRATION 8 »
Sustainable Development Goals based budgeting assessment



INVEST TO SAVE AND INNOVATE TO SAVE

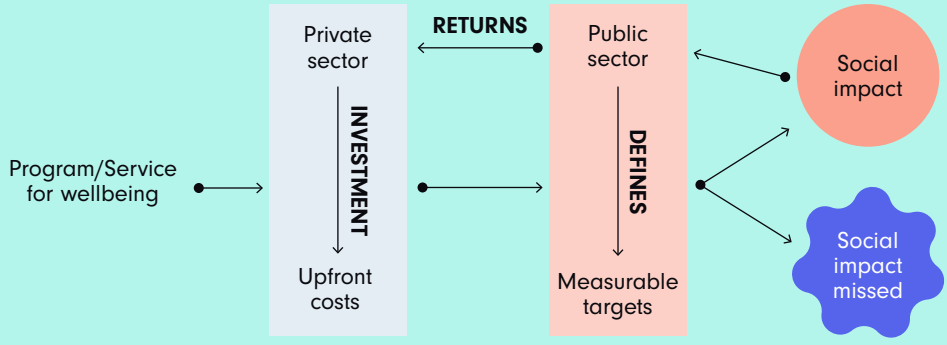
Another option is to use 'invest to save' and 'innovate to save' budgets where finance ministries make loans to ministries or agencies linked to predicted outcomes or savings. These can start off small but help to promote habits of more rigorous assessment of actions and results. The key is that applications should be precise and show the intended inputs, outputs and prospective outcomes. The overall aim should be that these allocations and agreements begin to look more like investment agreements rather than only being distributions of money.

Case 8
SOCIAL IMPACT BONDS

Social Impact Bonds are a form of impact investing. In an SIB, institutional and private investors fund services that promote well-being assume the risks associated with the provision of these services. Projects are given precise, measurable targets - for example around prisoner reoffending, employment or education results. The public sector only pays for results that are in line with the set targets.

There are now over 130 SIBs in use around the world.[45] SIB financing allows the government to partner with private service providers or other investors willing to cover the upfront costs and assume performance risk to expand promising programs. SIBs encourage innovation and tackle difficult social problems because new and innovative initiatives often have trouble securing government funding due to difficulties proving their efficiency. They work best in situations where there are relatively straightforward links between actions and outcomes.[46] Through the use of social impact bonds governments can optimize their use of resources to achieve the desired outcomes, whilst fostering innovations.[47]

ILLUSTRATION 9 »
Mechanism of the SIB



Improving feedback and learning and using data

Recent years have brought many innovations designed to make public spending more transparent, alongside the much broader movement of open data in government. Examples include USA Spending, which provides geographically tagged data on spending, and France's Open Fisca.[48] These have a long way to go in making spending truly transparent but they are important steps forward.

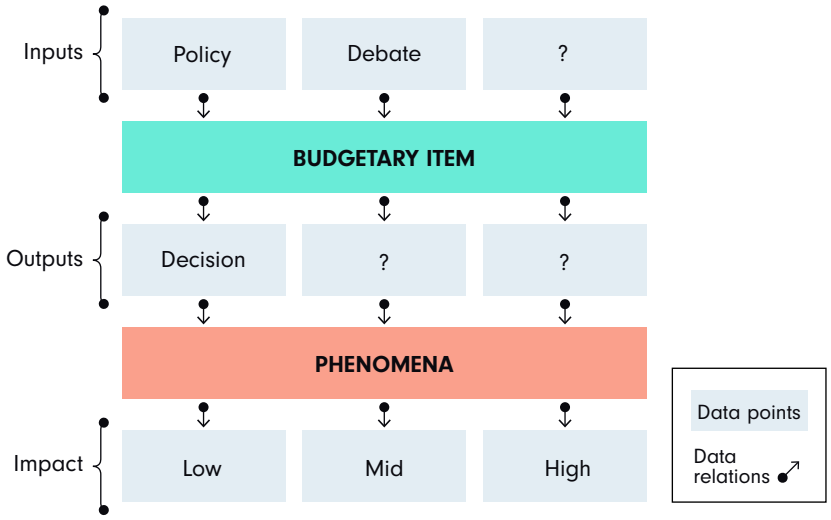
However, within governments there has been less obvious progress, and only few use management information systems that connect inputs and outcomes in any systematic way. Enterprise Resource Planning (ERP) methods are allowing for greater transparency in real time, tracking what has been spent, and over time what impacts are achieved or contributed to by different types of spending.[49] But this requires much more active engagement by ministries of finance and acceptance that a feedback-rich government will be more effective and efficient.

An example which links this theme and the previous ones is the recent work on the pound or dollar multiplier described earlier (see Case 4 above) seeking to analyse in more detail the dynamic impact of particular types of public spending, such as preventive action on education, health or crime. These are likely to have at least three types of impact: an overall benefit for society; cashable savings for government as a whole; and cashable savings for a particular ministry or department. The latter are often hard to achieve, partly because public spending is so lumpy (e.g. a preventive health measure may only deliver savings if a whole hospital is closed down, or if an investment in new capacity is avoided) but governments will increasingly benefit if they can put in place the right data architecture to capture these different kinds of impact.

DATA-TAGGING

A vital step for enabling smarter government will be more use of data tagging in budgeting. In the context of budgeting, data tagging refers to a practice in which all the budget allocations are 'tagged' or marked, by e.g. a phenomenon or goal they are contributing to, by geography or population group. Combined with rigorous and systematic ex-post evaluation of policy outcomes, data tagging would, over time, allow the government to better track the relation between budgetary decisions, inputs, outputs and outcomes of policies. More data will bring more opportunities in analysing correlation and developing sophisticated systems for informing decision-making with the possible impact of budgeting decisions for the long-term. This would contribute to greater budget transparency and hence accountability.

ILLUSTRATION 10 »
The relation between input, outcomes and impacts become more explicit by using data-tagging



DIGITAL TWIN

In the next few years, it will become feasible to create a digital twin of the budgetary system - i.e. a digital replica of all the contributing elements of the national budget and that could be placed on a traceable timeline, showing likely impacts budgeting decisions might have. Digital twins are becoming widely used in business and infrastructure management but have yet to be adapted to finance.

One example which has received quite a lot of attention is the creation of a digital twin of the Helsinki General Plan in Minecraft.[50] It enabled especially children and youth to explore the city in a familiar digital environment. Also the city of Rotterdam in the Netherlands has created a digital twin which is connected to sensors and monitors in the physical urban space. It enables the real-time following of e.g. flows of electricity, mobility and water. Moreover, the predictive capability of Rotterdam digital twin enables entirely new types of urban planning and development to happen.[51]

All in all, digital twins have the potential to become basic tools for planning and decision-support, as well as for greater engagement also of groups that are harder to reach or motivated, as shown by the example from Helsinki. Helped by large quantities of data and time series, it will become increasingly feasible to use AI applications to analyse patterns, correlations and causation soon also in finance.

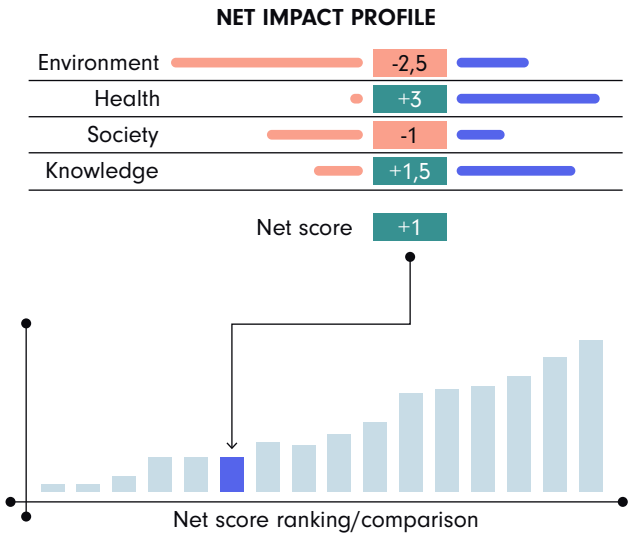
Case 9
THE UPRIGHT PROJECT'S NET IMPACT MODEL

The Upright Net Impact Model is a mathematical model of the economy that estimates the net impact of companies. The impact model produces continuously updated estimates of the net impact of companies by means of an information integration algorithm that consolidates data from humanity's accumulated scientific knowledge and public statistical databases. The aim of the model is to inform decision-making on resource allocation in terms of capital, environmental and human resources in order to maximize wellbeing. The Upright Net Impact Model measures costs and benefits in four dimensions: environment, health, society, and knowledge.[52]

The model provides clarity especially to value-driven decisions by providing a clear picture of related costs and benefits. This allows decision-makers to avoid gut-feeling decisions in favor of explicit assumptions about costs and benefits. The model collects and consolidates data using AI and an algorithm to analyse and compile data from public databases and thousands of scientific articles. By evaluating the impact of different decisions and scenarios, and calculating cost-benefit ratios in an automated way, decision-making around resource allocations can be significantly improved.

Currently, the model is being used by private sector representatives - e.g. by banks, pension funds, PE firms, VCs and other institutional investors - who want better data about the holistic impact of their investments. This means, in practice, that Upright is modeling the banks' or companies' assets to build a big picture of what their money actually gets done – and how this aligns (or does not) with their strategy and customer demands. In the future, a model like this could be used as a base for decision-making in the public sector as well - utilizing the Upright state of the art technology to analyse the impact of the decision at hand.

ILLUSTRATION 11 »
Net Impact measurement



New tools to combine public, business and personal investment for long-term impact

A final area for anticipatory public budgeting is new combinations of public and private finance that can, again, be guided by evidence and data. Specifically, we are interested in how public finance may develop new versions of personal accounts that encourage individuals to invest in their own long-term interests - like CPF in Singapore (see Case 10 below), and the wide range of skills credits currently being introduced in many countries by personal accounts into which government, individuals and businesses can all contribute.

These will work best in the future if they can be guided by data and navigation tools that help individuals know what long-term returns they may achieve from, e.g., learning a new skill to become more employable.

Another example is joint funding initiatives, in which the private sector, the civil society and the government jointly fund research, development and innovation initiatives with significant spillover effects. There are now many examples of these - with special purpose vehicles and partnerships combining funding from a range of sources to accelerate action, e.g. developing new technologies, or promoting urban development.

Case 10
CENTRAL PROVIDENT FUND

The Central Provident Fund (CPF) is a compulsory savings and pension plan for citizens and permanent residents in Singapore. The savings derived from monthly inserts is primarily intended to fund the citizens' retirement, healthcare, and housing needs. The CPF is an employment-based savings scheme with the help of employers and employees contributing a mandated amount to the fund for their benefits.[53]

Employees and employers are required to make monthly contributions to three different CPF accounts: for housing and retirement needs; one for exclusively retirement needs; and one for healthcare needs. The system aims to ensure that Singaporeans are equipped to manage their living costs during retirement. Ensuring adequate pension funding is critical as life expectancy in Singapore continues to rise, and the CPF has been viewed as a functioning model to ensure financial security while enabling individual accountability and ownership.

Case 11
EQUITY SAVINGS ACCOUNT

Investment savings accounts and equity savings accounts have become a popular means to encourage individuals to invest in their personal economy all around the world. These non-pension retail investment products incentivize ordinary citizens to invest and buy shares of domestic or foreign companies listed on a stock exchange by providing tax efficiency and tax incentives. The idea is that the account holder is exempt from paying taxes incurred from reinvestment of dividends paid to the account, thus benefiting from the compound interest effect. Account holders will not, however, be able to deduct losses on investment until the account has been closed, all the assets have been sold and the proceeds withdrawn.

In many jurisdictions, the stated aim of these schemes is often to boost greater retail investor participation in financial markets. In Sweden, the introduction of investment savings accounts by so-called ISK accounts in 2012 is one of the prime examples of how to encourage retail savings and investing – currently, more than two million accounts have been opened since the inception of ISK. Simultaneously, incentivising private investment is a way for governments to get individuals to invest in their own future in times when the future of pensions may look uncertain for younger generations.[54]

Case 12
UNIVERSAL BASIC ACCOUNT

The Universal Basic Account, a social security reform model developed by Finnish think tank Libera, aims to simplify the social security system and incentivize individuals to manage their finances and invest in their wellbeing. The idea is that the government provides each citizen with a fixed sum on their personal account (for example, 20000 EUR) which they are free to use during the course of their life. The individual can deposit funds and withdraw money for different expenses of their choice, such as financing their living costs while studying or in case of temporary unemployment. When the amount exceeds the baseline amount, the account holder can also invest the 'free funds' in financial instruments or pension funds, or use the funds to buy services. The use of the funds are tied to certain general restrictions that are enforced when the amount of funds decrease to a set level, or when funds are used in an excessive amount during a short period of time.

The idea behind the model is to give individuals more freedom and flexibility to work, save and invest money during the course of their lifetime in a way that they see fit whilst saving to the public sector the administrative burden of managing various social security systems at once. The model also intends to incentivize individual savings and investment in their own wellbeing.[55]

APB in the Future

Looking 5-20 years into the future, our hope is that Anticipatory Public Budgeting (APB) methods will become more mainstream. Governments would much more systematically describe the impacts they are seeking to achieve over time through spending on interventions and on intangibles of all kinds, whether early childhood support, university education, public health, or R&D.

Data tagging would be routine, and thanks to that much more use would be made of AI to track, map and analyse patterns and inconsistencies across policies and interventions.

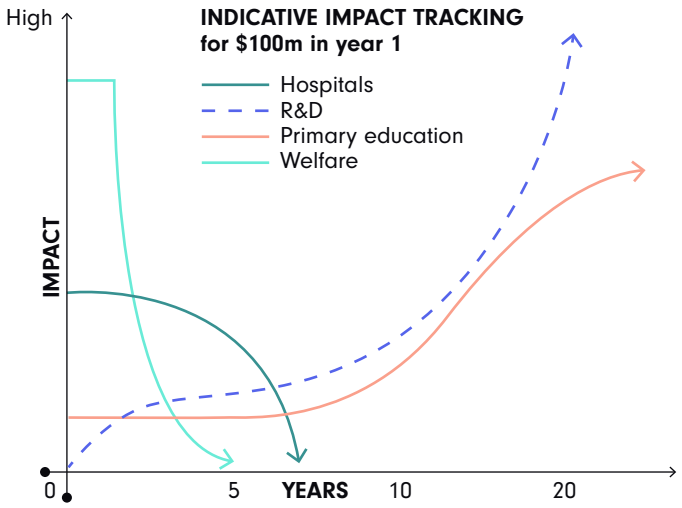
Governments would learn to think in a much longer-term way, mapping the relationships between inputs and outcomes over time (see the diagram below) and comparing what they expect to happen with what is actually achieved as a spur to learning.

These impacts will vary in nature - they do not have to be monetised. But they do need to be tracked and measured wherever possible.

Such mapping of results would increasingly capture the causal relationship between inputs and outcomes. At present governments badly lack tools for doing this, which makes it hard to judge not only where to allocate additional resources but also where to make cuts in periods of retrenchment.

In addition to mapping impacts over time - 1, 2, 5, 10, 50 years into the future - governments also often need ways of understanding the impacts of decisions made now on costs to the department or ministry itself and on costs or benefits to other parts of government. Our hope is that by the 2030s the methods to do this will be much more common.

ILLUSTRATION 12 »
Impact tracking in the long run, indicative

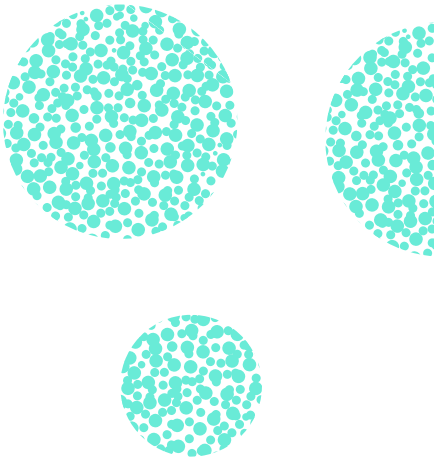


What's Next?

GOVERNMENTS ACROSS THE world are currently struggling with the very immediate pressures of COVID-19 which is putting huge strains on public budgets. Short-term necessity has crowded out long-term thought and action.

However, as the crisis eases, governments will again look at whether their systems and processes are fit for purpose. As this happens, it will become very evident that the methods used in public finance are long overdue reform and modernisation. We believe that much of the agenda set out here - including use of data, and embedding of longer time horizons - will become common sense.

We expect this agenda to be promoted most effectively and enthusiastically by those governments which are able to take a long view. In them, we might expect APB to become more mainstream and, eventually, common sense.



Annex

Advancing thinking on related issues: time, discount rates, data and AI

THE APPROACHES SET out here are also part of a broader family of tools to encourage better long-term decision making: more systematic use of futures and foresight methods; more help for the public to plan their own longer lives, from pensions to careers to family and learning; and better links between public policies and long-term global goals, such as carbon reduction.

HANDLING TIME: DISCOUNT RATES AND UNCERTAINTY IN PUBLIC FINANCE

A crucial issue is how to handle discount rates. How should governments think about value and costs in 10 or 50 years' time? Should a discount rate be applied to health? Or to the environment?

These issues are deeply contested in economics. The dilemma is whether governments should think like a bank (which means applying consistent discount rates to everything) or like a family (which probably applies a zero discount rate to things done for loved children). There are sophisticated arguments involved, such as adapting them to likely economic growth (which means the value of an additional dollar to the future generation will be less than to someone today who is poorer), time preference effects (we value something sooner more than later), uncertainty effects (the further into the future, the higher perhaps the discount rate might be) and distributional effects.

The programme described here is bound to raise issues of this kind - and we would encourage engagement with OECD, World Bank, IMF and others on how best to handle discount rates.

THE FUTURE INFLUENCE OF DATA AND ARTIFICIAL INTELLIGENCE

A theme throughout this paper has been the potential value of richer feedback on the links between inputs of spending and outputs and outcomes achieved. Currently these feedback loops are limited, helped by some research programmes but not embedded into the ways government works. Here we sketch out more on what might be achievable in the next 10-20 years by the most effective governments.

For any organisation making long-term informed decisions there are a limited number of frameworks to use, and all are inherently difficult when there is a big time gap between the action and the desired result, or when many factors are involved. For long-run allocations, there are essentially four main approaches to take.

One is to plan by inputs, extrapolating from past experience to judge, e.g., what the cost of x roads or of financial support for y thousand families will be. In this case the means are relatively fixed, while the outcomes or ends are allowed to vary.

A second approach is to plan through desired outcomes, working backwards to necessary inputs and adjusting according to deviation from a planned progression. In this model, the ends are fixed but the means are adjustable. Pension planning may often be a hybrid of this and the first approach: with a rough heuristic for inputs, a broad goal of income, and periodic adjustments.

A third approach is probabilistic – analysing potential threats and risks, and working out what cost in the present is worthwhile to avoid or mitigating a risk given its likelihood and potential impact.

A fourth, more novel approach, attempts a coupled planning system which can over time adjust both means and ends. This requires a proportion of finance to be allocated to supporting intelligence systems which provide not just a monitoring or audit function, but also a way of assessing whether the ends are still sensible and whether the chosen means are working. This can be formalised through stage-gates milestones that assess ends, means, and the financial link between the two.

This last approach will increasingly be supported by technology. Over the next few years we expect public finance, like all aspects of government, to be influenced by AI and new approaches to data. Collecting more data on the relationship between inputs and outcomes of public spending brings governments to the core question in AI – the problem of 'credit assignment', i.e. the problem of how to rate past actions, determine what caused what, and what to value most in terms of contributing to future desired outcomes (often then also applying a discount rate to these). More systematic capture of data on inputs, along with clarity about which outcomes and over what time scales they are seeking to influence will make it much easier to use deep learning and reinforcement learning to help governments make smarter decisions about alternative courses of action. The various pilots described here will, in other words, contribute to some of the essential conditions for smart government in the future.

Endnotes

1. OECD (2020).
2. Government of Japan (2019).
3. Government of United Arab Emirates (2020a).
4. See e.g. Boston (2016).
5. There are a few exceptions, such as the work of the Washington State Institute for Public Policy which has had a significant influence in the state of Washington in the US, particularly in criminal justice. See https://www.wsipp.wa.gov/BenefitCost
6. OECD (2020).
7. The Treasury of New Zealand (2019).
8. See e.g. Boston (2016).
9. World Bank (2020) provides a useful summary.
10. National Audit Office of Finland (2020).
11. In the International Glossary of Business Valuation Terms, intangible assets are defined as "non-physical assets such as franchises, trademarks, patents, copyrights, goodwill, equities, mineral rights, securities and contracts (as distinguished from physical assets) that grant rights and privileges, and have value for the owner." Intangible assets also include new software, database, copyrights, designs, trademarks, organisation and distribution networks (Demmou et al., 2019).
11. See e.g. the 2020 Long-Term Budget Outlook from the Congressional Budget Office: https://www.cbo.gov/publication/56598
12. See the OBR's Fiscal Sustainability Report at https://obr.uk/fsr/fiscal-sustainability-report-july-2020/
13. See e.g. Budgeting Division at the OECD Directorate for Public Governance: http://www.oecd.org/gov/budgeting/
14. Afonso and Kazemi (2017).
15. See e.g. Corrado et al. (2015).
16. Yousefi (2019).
17. Her Majesty's Treasury of the United Kingdom (2020).
18. Ibidem.
19. Performance budgeting is defined by the OECD (2019) as the systematic use of performance information to inform budget decisions, either as a direct input to budget allocation decisions or as contextual information to inform budget planning, and to instil greater transparency and accountability throughout the budget process, by providing information to legislators and the public on the purposes of spending and the results achieved.
20. See e.g. Damart and Roy (2009).
21. For a review of CBA criticisms, see e.g. Turner (1979).
22. Steger (2010).
23. See OECD (2019), pp.155-157.
24. For example World Bank (2015) suggests that the returns to schooling are 10% per year of schooling, with the returns to tertiary education outweighing those of primary or secondary education. Lynch (2007) concludes that investing in early childhood education is particularly beneficial for the state in the long-term. Heckman et al. (2015) shows that targeting disadvantaged children when providing public early childhood education is particularly beneficial for the state. Based on these findings, the study recommends targeting quality early childhood education programs specifically to disadvantaged families.
25. Ibidem.
26. For example, there is little point spending more on higher education if quality is low in secondary education.

27. For example, some of the benefits of US Head Start disappeared because of other social factors. For a review of evidence, see https://www.nhsa.org/knowledge-center/center-for-policy-data-and-research/facts-and-impacts/
28. For example, the USSR or Ireland in the 1970s and 1980s.
29. See https://educationendowmentfoundation.org.uk/evidence-summaries/teaching-learning-toolkit/
30. There is strong evidence of returns on investment in some preventative health interventions. From an economic perspective, Owen et al. (2012) analysed the cost-effectiveness of public health interventions and found that most of them were highly cost-effective. Interventions focusing on the entire population, such as promoting healthy eating via mass-media, tended to be the most cost-effective. The cost of treating people suffering from preventable conditions can be high: in the UK, it is estimated that costs to the NHS relating to tobacco use, obesity and physical inactivity are £2.7, £4.2, £1.06 billion a year respectively. The World Health Organization (2014) argues that prevention measures are not only generally cost-effective but some can also provide quick returns to investment (within two years of implementation), such as promoting healthy lifestyle and mental health as well as some vaccinations.
31. Geoff Mulgan chaired a review for the UK Secretary of State for Health in 2009 on applying behavioural insights to health, one of many prompts for the use of new methods of this kind. Also, in the UK for instance, a first-of-its kind strategy has been fashioned under the auspices of Public Health England and the Behavioural Insights Team, with the aim of using knowledge from these fields to improve health and reduce health inequalities.
32. See the report advocating a new research programme for the UK to redress this imbalance by Nesta (2019).
33. See the report by the Chartered Institute of Public Finance and Accounting (2019).
34. For example, there is ample evidence of the positive impact of R&D investment by companies on overall economic growth. Falk (2007) studied R&D investment in OECD countries from 1970 to 2004 and found that private enterprises' R&D investment had a positive impact on national GDP. Furthermore, he found that R&D investment in the high-tech sector equally has a positive correlation with economic growth measured by GDP. A policy brief produced by the European Commission's DGI for R&I summarizes the key findings of R&I investment on economic growth (European Commission, 2017). While there is variation between countries, R&I investment contributes significantly to economic growth in Europe: up to two-thirds of economic growth derives from R&I investment (Bravo-Biosca et al., 2013) while 15% of productivity gains in Europe can be traced back to R&I investment (citing EIB, 2016). In the context of South Africa, Tsvakirai et al. (2018) studied the impact of R&D investment on the South African peach and nectarine industry and found that investment in the Agricultural Research Council's peach and nectarine research programme led to increased value in the industry.
35. European Commission (2015).
36. European Commission (2019).
37. The Treasury of New Zealand (2019).
38. See Australia's Productivity Commission: https://www.pc.gov.au/ and Netherlands' CPB: https://www.cpb.nl/en/what-does-cpb-do
39. Hendrix (2017).
40. Government of United Arab Emirates (2020b).
41. Hendrix (2017).
42. IMF (2019).
43. See Chapter 10, Mulgan (2007).

44. The National Audit Office of Finland (2020).
45. Impact Bond Global Database. Access at: https://sibdatabase.socialfinance.org.uk/
46. For a more detailed analysis of the strengths and weaknesses of SIBs, see Mulgan (2015).
47. See e.g. Sitra's SIB Funds: https://www.sitra.fi/en/projects/sib-funds/
48. See USA Spending at: https://www.usaspending.gov/ and France's OpenFisca at: https://www.data.gouv.fr/en/organizations/openfisca/
49. More about Public Sector Enterprise Resource Planning at: https://www2.deloitte.com/us/en/pages/public-sector/articles/public-sector-enterprise-resource-planning.html
50. See Helsinki's Digital Twins project at: https://www.hel.fi/helsinki/en/administration/information/general/3d/potential-uses/
51. See Rotterdam's Digital Twin project at: https://eu-smartcities.eu/news/rotterdams-digital-twin-redefines-our-physical-digital-social-worlds
52. See The Upright Project at: https://www.uprightproject.com/
53. See Singapore's CPF at: https://www.cpf.gov.sg/Members/AboutUs/about-us-info/cpf-overview
54. See Sweden's ISK at: https://www.fondbolagen.se/en/Facts_Indices/sweden-a-world-champion-in-fund-savings/
55. Lillrank et al. (2013).

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