

Building systemic resilience, productivity and well-being: a Mental Wealth perspective

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INTRODUCTION

Countries face dynamic, multidimensional and interconnected crises. The pandemic, climate change, rising inequalities, food and energy insecurity, polarisation, misinformation and declining trends in youth mental health, are converging to cause enormous socio-political and economic consequences that are weakening democracies, corroding the social fabric of communities, and posing threats to social stability and national security. A Mental Wealth perspective argues that the extent to which nations can respond to these poly-crises depends on the quality of, and investments in, a critical national asset: brain capital. Brain capital encompasses a nation's cognitive and emotional resources including (1) brain skills—cognitive capability, emotional intelligence and the ability to collaborate, be innovative and solve complex problems, (2) brain health which includes mental health, well-being and neurological disorders that critically impact the ability to deploy brain skills effectively, build and maintain positive relationships, and display resilience against challenges and uncertainties.¹ Although brain skills and brain health are commonly examined at an individual level, brain capital represents a broader, collective concept and national asset that is a fundamental contributor to economic and social productivity (Mental Wealth—[box 1](#)).

The aim of this paper is to provide a systemic perspective on the interdependencies between brain capital (particularly mental health), economic and social well-being, and resilience. By transcending traditional disciplinary boundaries, the paper explores the drivers and potential strategies for enhancing systemic resilience. As global

SUMMARY BOX

- ⇒ A paradigm shift is needed in our approach to building systemic resilience.
- ⇒ Social and economic systems will continue to be subject to regular and increasing disruption, whether a result of cyclical economic contractions or exogenous (natural disasters, pandemics) and endogenous shocks (financial crises, war, civil disruption or intensifying technological change).
- ⇒ This paper emphasises the detrimental impact of responses such as underemployment and unemployment on individuals, communities, and the nation's cognitive and emotional resources, which are critical for sustaining productivity.
- ⇒ The aim of this paper is to provide a systemic perspective on the interdependencies between brain capital (particularly mental health), economic and social well-being, and resilience.
- ⇒ Through a Mental Wealth lens, the paper offers fresh insights into enhancing national prosperity and resilience to better face looming global threats
- ⇒ While global health researchers endeavour to improve health and well-being, and business leaders and policy makers seek to promote productivity and economic prosperity, this paper advocates for a more interconnected approach to achieve both.
- ⇒ By urging global public health, business and economic audiences to think beyond their disciplinary boundaries and engage in transdisciplinary efforts, this holistic perspective opens new possibilities for fostering stability, cohesion, prosperity and sustainability.

health researchers endeavour to improve health outcomes and foster more resilient societies, and business and economic policy audiences seek to promote productivity and economic prosperity, this paper advocates for a more interconnected approach. It urges global public health and business audiences

Box 1 What is Mental Wealth?

Currently, Gross Domestic Product (GDP) is the key measure used by governments, the media and the community to understand, track and compare national economic performance. However, GDP is inadequate as a measure of national prosperity. The exclusion of social production from this predominant indicator sends a signal that society does not value the many other ways that people contribute to civic vibrancy, community well-being and national prosperity. Mental Wealth is a holistic measure of national prosperity that captures the value generated by economic *and* social productivity. It broadens the boundary of GDP to include the monetary value of unpaid activities that contribute to strengthening the social fabric of nations.⁶³ In essence, Mental Wealth is a measure of the strength of a Wellbeing Economy. While its calculation is described in detail elsewhere,²⁹ in summary a non-market valuation method is used to estimate the value contributed to a nation by hours spent on unpaid activities including volunteering, caring for children, the sick or disabled, ecological restoration, building community infrastructure, unpaid informal education, training and mentoring, providing a crowd service, and making unpaid contributions to the creative arts (ie, social production). The value of social production is then added to the value of economic production (GDP). Further explanation on how the monetised Mental Wealth metric differs from other well-being indices is provided in Occhipinti *et al.*⁶³ Further, Mental Wealth is more than simply an indicator, it provides a framework for understanding a critical feedback loop—whereby economic and social factors influence the accumulation and deployment of brain capital, which in turn drive economic and social productivity.¹

to think beyond their usual disciplinary confines and engage in transdisciplinary efforts to achieve systemic change. In doing this, the paper navigates a critical tension arising from the need for both immediate action and systemic change, that is, improving the existing economic system to foster brain capital in the short term and simultaneously taking initiatives to achieve systemic resilience by challenging the dominant economic paradigm fundamentally. Rather than advocating for a singular approach, the paper embraces both agendas, striving for an inclusive, balanced and practical strategy to tackle this complex issue in the near term while also offering more radical suggestions to achieve systemic transformation over the longer term.

RESILIENCE AT RISK

Resilience is vital if individuals, communities, businesses, institutions and economies are to flourish. Commonly considered the ability to endure and recover quickly from crises, resilience may be more aptly defined as ‘the capacity of social, economic, and environmental systems to cope with a hazardous event or trend or disturbance, responding or reorganizing in ways that maintain their essential function, identity, and structure, while maintaining the capacity for adaptation, learning, and transformation’.² With this broader definition, resilience depends as much on the ability to let go of qualities, beliefs and directions that can no longer be sustained, as

it does on understanding and preserving central ‘identity’ and function throughout a process of adaptation. Fundamental to success in navigating the adaptation process are decisions about *what we value*.³

Economic downturns are not exceptional events. The US economy, for example, is estimated to have been in recession almost as often as not over the last century (excluding periods of active government intervention to maintain full employment).^{4,5} Globalisation and digitalisation are synchronising, amplifying and accelerating the diffusion of downturns globally. In addition to cyclical economic downturns, countries face dynamic, multidimensional and interconnected crises including climate change, energy shortages, rising inequity, food insecurity, and internal and international conflict, which cause significant economic and social disruption.⁶ Therefore, whether a result of the cyclical inevitability of market-based systems, given their design, operation and management, or of exogenous and endogenous shocks, social, economic and business systems will continue to be subject to frequent disruptions.

Mass unemployment and underemployment in response to economic downturns, often characterised as a ‘necessary’ element of ‘adjustment’, can have long-term scarring effects (due to hysteresis), especially in the face of fiscal consolidation (particularly austerity). In addition, economic challenges such as inflation often prompt policy induced unemployment aimed at reducing demand and promoting price stability. This labour under-usage reduces the capacities, capabilities and well-being of the single most valuable asset and central identity of any nation: its people. In essence, key short-term responses aimed at safeguarding business survival and a ‘stable economic environment’ (traditionally viewed as vital for business resilience) ultimately acts to undermine the very productive potential that is critical to an economy’s longer-term resilience and competitiveness. While economic resilience has several important facets—geopolitical, energy, climate, supply chains, technology, organisation, education and healthcare—underpinning them all is human ingenuity, solidarity and productivity. This paper uses a Mental Wealth lens to describe the preconditions for sustainable social, economic and business resilience.

HUMAN PRODUCTIVITY AND WELL-BEING: PRESERVING WHAT IS MOST VALUABLE

Human productivity is central to the functioning of society and its preservation is a critical starting point for achieving multisystem resilience. As Nobel prize winning economist Paul Krugman famously stated; ‘Productivity isn’t everything, but in the long run it is almost everything’.⁷ Productivity growth raises living standards (when equally distributed across society), increases competitiveness and improves business performance and investment opportunities. Given a concern with the human dimension of economic performance the labour

element of productivity is of particular interest. The global slowdown in aggregate labour productivity since the 1990s has ignited significant debate.^{8–10} Commonly reported causes of the slowdown include declining innovation, an imbalance or deterioration in diffusion of innovation across sectors, a stabilisation of educational attainment, a deceleration of working-age population growth and increasing monopolisation with global frontier firms increasing their market share.^{8 11 12} The role of brain capital (encompassing brain health, mental capital, mental health and well-being) as a key driver of productivity and resilience is part of an emerging interdisciplinary (neuroscience, medicine, social science, etc) and systemic perspective in the broader, largely economic debate.

Being productive is important for mental health. Studies dating back to the 1930s highlight the relationship between labour market status and well-being, demonstrating both the positive impacts of being engaged in productive work and the negative effects of unemployment.¹³ Unemployment and underemployment are associated with significant increases in psychological distress, mental ill-health and suicidal behaviour.^{14–24} With increasing duration of unemployment, perceived helplessness is theorised to reduce a person's motivation to search for employment or acquire new skills due to the belief that actions will have little or no effect on their circumstances.^{13 25} Well-being impacts can also occur when workers experience a reduction in wages, conditions and job security on reemployment.

In addition to its detrimental effect on mental health and well-being, unemployment is thought to erode mental capital. According to Kirkwood *et al*,²⁶ unlike fiscal capital, mental capital 'is not depleted by 'spending' it';²⁶ rather, the ongoing acquisition and deployment of new skills through work is essential for the growth of mental capital that underpins innovation and in turn, productivity. The extent of mental capital depreciation associated with unemployment and its impact on future productivity is dependent on duration of unemployment and the extent to which there is a mismatch between former and new occupations.^{27 28}

RESILIENCE: A MENTAL WEALTH PERSPECTIVE

Broadening the lens of productivity

Intrinsic to the concept and measurement of Mental Wealth is a broader perspective of human productivity (encompassing the domains of economic *and* social productivity), and an understanding that these domains are inextricably linked (box 1). Under the Mental Wealth framework, socially productive activities include unpaid charity work, volunteering, participation in community groups and organised civic engagement, the education and care of children, environmental restoration and caring for country, and developing physical and institutional social infrastructure; essentially any activity that contributes to strengthening civic life. Richer depictions

of social production and its mental health and social value are articulated elsewhere.²⁹ Recognising the value of social production for national prosperity counters the marginalising and exclusionary effects (on caregivers, the unemployed, the disabled and older adults) of only valuing contributions made to the formal, monetised economy. Recent reports highlight that the greatest contributors to social production are those that are traditionally undervalued by the formal economy. For example, Americans aged 65 and over contributed US\$319.22 billion in social production through voluntary work and community building activities, the largest contribution of any age group.^{30 31}

Social productivity acts as a temporary stabiliser to disruptive events by redistributing resources between the economic and social arenas and mobilising workforces.^{29 32 33} During the COVID-19 pandemic, neighbourhood initiatives and 'Buy Local' campaigns supported small businesses.³⁴ In the aftermath of the 2004 Indian Ocean Boxing Day tsunami, grass-roots mobilisation and community networks supported the recovery of small-sized and medium-sized enterprises.³⁵ In the Australian bushfires of 2019–2020, communities rallied to save local businesses and houses from damage, and in the recovery phase established campaigns such as 'Empty Esky' and 'Spend With Them' to support regional business revival. Maintaining adequate levels of social productivity creates readily deployable workforce surge capacity able to mount an effective and coordinated response against local, national and global threats. Volunteer and community mobilisation have long played a critical role in successful disease control and elimination campaigns globally, from smallpox eradication in the 1960s and 1970s to the COVID-19 pandemic, where volunteers mobilised to support contact tracing, phone hotlines, childcare for frontline workers, and awareness campaigns in efforts to control transmission and expedite the reopening of businesses.^{36–38}

The maintenance of social productivity during periods of economic stability and expansion can also increase access to employment³⁹ and enhance economic productivity through access to additional networks, resources, opportunities, informal skills training and mentorship, the social development of intellectual property and inter-generational knowledge transmission.⁴⁰ Therefore, the relationship between civil society and the business sector is one of mutual dependence, with economic and social productivity being two sides of the same coin. Both are required to achieve multi-sector resilience.

The importance of brain capital

The concept of Mental Wealth also calls attention to brain capital. This concept has been the focal point for a novel research and policy agenda underpinned by a broad range of disciplines concerned with brain health. Brain capital is a new asset class that recognises brain skills and brain health as fundamental drivers of the economy. Brain skills (or mental capital) include

Table 1 Proposed multi-sector strategies to foster social and brain capital rich environments, improve economic and business resilience, and the transition to an inclusive and well-being orientated economy*

Recommendations	Priorities
Invest in Brain Capital	<p><i>a. Build an innovation system and close the productivity distribution gap</i></p> <ul style="list-style-type: none"> ▶ Supporting the diffusion and uptake of business innovation can yield broad productivity benefits and enhance mental capital and transferable skills. ▶ To reverse the productivity slowdown, significant investments in research and innovation are needed, accompanied by well-designed national policies that move beyond the traditional linear ‘lab to market’ model of commercialisation to the development of ‘innovation ecosystems’. ▶ Enhancing cognitive and relational competencies to leverage technological advances and adjusting business skill structure to resemble frontier firms are proposed to deliver the largest gains in reducing the cross-sector productivity gap. <p><i>b. Innovations in vocational education and reinvestment in workforces</i></p> <ul style="list-style-type: none"> ▶ Workers need to acquire advanced skills like technological know-how, problem-solving, critical thinking, collaboration and empathy due to the increase in automation and the changing nature of work. Such skills are best acquired in the context of developing deep disciplinary and/or professional/trade expertise. This is a particular priority for countries with the lowest human capital investments, where it has been estimated that the workforce of the future will only be one-third to one-half as productive as it could be if people enjoyed full health and received a high-quality education.^{64 65} ▶ Collaboration between employers and educators is crucial to create an adaptable workforce with quality, transferable vocational skills, reducing vulnerability to productivity declines and skills shortages. ▶ Occupational structures should be developed to enable easier transitions between related domains of work, allowing individuals to navigate changing labour market opportunities. Micro-credentialing can facilitate transitions promoting upskilling, flexibility and improved access to education, benefiting disadvantaged populations, provided they build on systems that give quality, foundational qualifications of disciplinary, trade or professionally defined domains of expertise. <p><i>c. Invest in Brain Health Living Labs</i></p> <ul style="list-style-type: none"> ▶ Brain Health Living Labs, facilitated by public–private–people partnerships, are needed to integrate clinical care, research and innovation to accelerate the development of evidence-based brain health solutions across all stages of life. ▶ Research and innovation efforts should go beyond clinical trials to explore optimal mental health system design. ▶ Models of care need to emphasise social, vocational and educational functioning, and successful work transitions. <p><i>d. Fostering collective intelligence</i></p> <ul style="list-style-type: none"> ▶ In the post-pandemic era, business needs to move beyond a short-term focus on incentives to boost individual worker productivity and make longer-term investments in brain capital and the creation of work environments that foster collective intelligence as a pathway to enhancing innovation and adaptation. <p><i>e. Revitalising the foundational economy</i></p> <ul style="list-style-type: none"> ▶ During the COVID-19 pandemic, exemptions from lockdowns reminded all societies of what sectors were most important in economic and social life. They were health, education, the food supply chains and utilities (especially telecommunications), and the provision of quality social services—especially aged and disability care. ▶ For the last 30 years, large-scale experiments with outsourcing, compulsory competitive tendering, and the creation of quasi-markets in education and human services have steadily hollowed out the quality of the foundational economy.⁶⁶ Unless the foundational economy is strengthened, the above initiatives will have limited impact.^{67 68}

Continued

Table 1 Continued

Recommendations	Priorities
Programmes to guard against mass unemployment	<p>The following key programmes and initiatives can prevent and address the devastating effects of mass unemployment:</p> <ul style="list-style-type: none"> ▶ Job retention programmes during economic downturns – such as those implemented during the COVID-19 pandemic (eg, JobKeeper) preserved jobs and supported incomes, reducing the mental capital, social and mental health consequences of unemployment. These programmes should include vulnerable groups such as those reliant on casual work, individuals developing new skills, and those without accumulated assets or independent social networks. ▶ Short-time work schemes, already in place in several countries, help businesses facing temporary declines in demand by avoiding job separations, reducing job destruction rates and improve business survival. ▶ Investments in infrastructure for economic stimulus (usually roads, tunnels, bridges) should consider opportunities for transitions towards new goals, such as the green transition, workforce re-skilling or boosting social capital infrastructure.
Foster social productivity	<p>Initiatives such as the Universal Basic Income (UBI), other unconditional cash transfers, and the Job Guarantee (JG) have been proposed to eliminate poverty, income insecurity, and achieve full employment. While these initiatives may enhance engagement in socially productive activities, an alternative initiative, the Participation Wage⁴⁹ may have several benefits over the UBI and JG, namely, it:</p> <ul style="list-style-type: none"> ▶ Provides a living wage to those that are unemployed, underemployed or not participating in the formal economy, but are participating in socially productive activities. ▶ Strengthens the under-resourced community sector and directly promotes social productivity. ▶ Driven by individuals' meaningful social contributions, shifting the meaning of work to be more inclusive. ▶ Flexible and adaptable to social, economic and environmental changes. ▶ Provides an alternative or supplement to the aged pension, incentivising continued social participation in retirement.
Establish a legal framework for resilience	<p>A legal framework and/or legislative changes are needed to ensure cross-system resilience and support a universal minimum level of social productivity and infrastructure.</p> <ul style="list-style-type: none"> ▶ Reforms should focus on ending unhelpful subsidies, improving labour market regulations, globally overhauling taxation policies to achieve a fairer distribution of the gains of productivity, and redesigning social and economic structures to ensure more inclusive, liveable societies. ▶ The framework would encompass an adaptive supply chain, with technology serving as an enabler, and deploy financial and fiscal buffers as defensive supports within an overall proactive stance. ▶ Environmental, social and governance frameworks need to explicitly add brain capital and resilience to their focus and recognise the essential reskilling and upskilling requirements that are needed to help individuals and organisations adapt to a changing world. ▶ A resilience legal framework would foster the cooperation of public sector, private sector and civil society organisations in supporting sustainability and inclusiveness across societies and help build a more resilient, stable and secure world for all.

*An expanded version of this table is available in online supplemental file 1.

cognitive, emotional, and collective intelligence and creativity, while brain health includes mental health and well-being which affect the ability to acquire and deploy mental capital, as well as neurological disorders which fundamentally change social and economic productive potential.^{1 29} Worldwide, it is estimated that the cost of lost productivity attributable to depression and anxiety alone is US\$1.15 trillion per year.⁴¹ However, such estimates fail to adequately capture the counterfactual; namely, the potential increase in innovation and collective productivity (beyond individual absenteeism and presenteeism) that may have been possible with optimal population brain health.

Much of the economic discourse regarding the relationship between brain capital and labour productivity has been unidirectional, focussing on how boosting brain capital has benefits for productivity. The ‘happy-productive worker thesis’ has deep roots in the organisational psychology literature and posits that individuals with higher levels of well-being tend to be more productive.^{42 43} The evidence to some extent supports this thesis.⁴⁴ Representing a potentially ‘low energy, low material way of raising labour productivity’⁴⁴ this thesis gave rise to a thriving corporate ‘wellness market’ in the late 20th century. In 2021, the Corporate Wellness market globally was valued at US\$54.1 billion and is expected to reach US\$93.4 billion by 2028.⁴⁵ However, fitness memberships, mindfulness training, on-site yoga and workplace health promotion are inadequate to tackle the challenge of declining productivity. ‘Add on’ programmes of this nature leave problematic structures in place. Evidence additionally suggests a converse relationship, namely, that macroeconomic structures and organisational strategies engaged to continuously grow labour productivity can in the long run reduce job quality and circle back to negatively influence worker well-being and productivity, thereby countering workplace well-being promotion efforts.⁴⁶

A recent review of the literature emphasised the potential negative relationship between a pursuit of continuous growth in labour productivity and worker well-being, resulting from increases in alienation, job demands, pervasive technology that blurs the boundary between work and home life, and industrial relations reforms that increase insecure work.⁴⁴ Higher job demands have been associated with greater anxiety, work-related family conflict and burnout. Job insecurity has been shown to have detrimental effects on job satisfaction, mental health and well-being, and increases psychosomatic complaints.^{47–49} Conversely, improvements in job security have been associated with stepwise improvements in mental health scores.⁵⁰ In addition to the work environment, the broader social environment in which people live can have a significant influence on brain capital. Economic structures and policies drive interconnected disparities in income, wealth, education, health and opportunities.^{51 52} This can lead to increased rates of violent crime, substance misuse, domestic violence,

child abuse and neglect, inadequate housing, inadequate mental healthcare systems and poor education quality, resulting in significant functional impairment that erodes productive potential—both in the near term and intergenerationally.^{53–58} Additionally, globalisation, while offering opportunities, can also bring with it resource over-exploitation, environmental destruction, and cultural dissonance, exacerbating poverty, polarisation, and social unrest, and eroding social cohesion.^{59 60} These structural factors can have a profound impact on brain capital and productivity.

In sum, there is a reciprocal dependence between brain capital and productivity. Social and economic productivity are needed to maintain brain capital, and investments in brain capital are needed to boost productivity. However, when productivity demands (be they economic or social^{61 62}) exceed brain capital capacity, resilience can be undermined. This thesis gives rise to several questions: (1) where does the threshold lie beyond which demands in productivity growth exceed brain capital capacity, thereby reducing resilience, (2) can the threshold be raised by technological advances, reductions in inequality, and investments in brain and social capital infrastructures and (3) what is the optimal balance between economic and social productivity at a macro level needed to support multisystem resilience? These are important questions for further empirical exploration. The balance required in any context will depend on prevailing circumstances, especially legacies concerning the role of the state, business and civil society in the organisation of production and consumption and the arrangements determining the distribution of income and wealth. In thinking through ways to achieve balance and enhance resilience, [table 1](#) (and online supplemental file 1) highlights four domains requiring attention: investing in brain capital, guarding against mass unemployment and productivity loss, fostering social productivity and establishing a legal framework for resilience. Systems modelling and simulation is additionally proposed to explore the viability of the recommended strategies in different political and economic contexts and how best to allocate resources across them to build resilience and foster the Mental Wealth of nations.⁶³ A paradigm shift in our understanding of resilience is imperative. By embracing a transdisciplinary Mental Wealth perspective and nurturing a nation’s most critical asset (brain capital), we deepen and enrich our capacity to evolve and adapt in a more stable, cohesive, prosperous and sustainable way.

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Competing interests Authors WH, PG, YJS, AP, AS, GU, JB, RG, SR, AF declare they have no conflicts of interest relevant to this work. Author JO is both Head of Systems Modelling, Simulation & Data Science, and Co-Director of the Mental Wealth Initiative at the University of Sydney's Brain and Mind Centre. She is also Managing Director of Computer Simulation & Advanced Research Technologies (CSART) and acts as Advisor to the OECD Neuroscience-inspired Policy Initiative and the Brain Capital Alliance. Author IBH is the Co-Director, Health and Policy at the Brain and Mind Centre (BMC) University of Sydney, Australia. The BMC operates an early-intervention youth services at Camperdown under contract to headspace. Professor Hickie has previously led community-based and pharmaceutical industry-supported projects (Wyeth, Eli Lilly, Servier, Pfizer, AstraZeneca) focused on the identification and better management of anxiety and depression. He is the Chief Scientific Advisor to, and a 3.2% equity shareholder in, InnoWell Pty Ltd. InnoWell was formed as a joint venture by the University of Sydney (32% equity) and PwC (Australia; 32% equity) to deliver the \$30m Australian Government-funded Project Synergy (2017-20); a three-year program for the transformation of mental health services) and to lead transformation of mental health services internationally through the use of innovative technologies. HE is a consultant to PRODEO LLC (an executive services group for brain health technologies), the Meadows Mental Health Policy Institute and the Euro-Mediterranean Economists Association. In the past, he has received consulting income from Delix Therapeutics, Neo Auvra and Johnson and Johnson. This paper does not necessarily reflect the views, opinions and arguments employed by the OECD or its Member governments and is only the view of the authors.

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REFERENCES

- Smith E, Ali D, Wilkerson B, et al. A brain capital grand strategy: toward economic Reimagination. *Mol Psychiatry* 2021;26:3-22.
- IPCC. Summary for policymakers. In: Field CB, Barros VR, Dokken DJ, et al. eds. *Climate Change 2014: Impacts, Adaptation, and Vulnerability Part A: Global and Sectoral Aspects Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*. Cambridge, United Kingdom and New York, NY, USA: Cambridge University Press, 2014: 1-32.
- Lerch D. Six foundations for building community resilience. In: Lerch D, ed. *The Community Resilience Reader*. Washington, DC: Island Press, 2017.
- Quiggin J. *Economics in Two Lessons: Why Markets Work So Well, and Why They Can Fail So Badly*. Princeton: Princeton University Press, 2019.
- Quiggin J. Crises and recession as the norm. *J Aust Political Econ* 2020;85:39-43.
- Tooze A. *Shutdown: How Covid Shook the World's*. Penguin Books Limited, 2021.
- Krugman P. *The Age of Diminished Expectations*. Cambridge: MIT Press, 1994.
- Andrews D, Criscuolo C, Gal PN. *The global productivity slowdown, technology divergence and public policy: a firm level perspective*. Brookings Institution, 2016.
- Gordon RJ. Why has economic growth slowed when innovation appears to be accelerating? BER working paper no.W24554 [SSRN]. 2018. Available: <https://ssrn.com/abstract=3170773>
- Brynjolfsson E, McAfee A. *The second machine age: Work, progress, and prosperity in a time of brilliant technologies*. New York, NY, US: W W Norton & Co, 2014: 306.
- Dieppe A. The broad-based productivity slowdown, in seven charts [World Bank]. 2020. Available: <https://blogs.worldbank.org/developmenttalk/broad-based-productivity-slowdown-seven-charts#:~:text=The%20productivity%20slowdown%20is%20due%20to%20multiple%20factors&text=Working%20age%20population%20growth%20has,global%20value%20chains%20has%20stalled> [Accessed 19 Mar 2023].
- Green R, Agarwal R. Three theories for what's causing the global productivity slowdown. *The Conversation*; 2017.
- Cole K, Daly A, Mak A. Good for the soul: the relationship between work, wellbeing and psychological capital. *The Journal of Socio-Economics* 2009;38:464-74.
- Paul KI, Moser K. Unemployment impairs mental health: meta-analyses. *J Vocat Behav* 2009;74:264-82.
- Clark AE. Unemployment as a social norm: psychological evidence from panel data. *J Labor Econ* 2003;21:323-51.
- Morrell SL, Taylor RJ, Kerr CB. Unemployment and young people's health. *Med J Aust* 1998;168:236-40.
- Erlangsen A, Banks E, Joshy G, et al. Measures of mental, physical, and social wellbeing and their association with death by suicide and self-harm in a cohort of 266,324 persons aged 45 years and over. *Soc Psychiatry Psychiatr Epidemiol* 2021;56:295-303.
- Dooley D, Prause J, Ham-Rowbottom KA. Underemployment and depression: longitudinal relationships. *J Health Soc Behav* 2000;41:421-36.
- Allan BA, Kim T, Shein B. Underemployment and mental health: a longitudinal study. *J Couns Psychol* 2022;69:578-88.
- Page A, Milner A, Morrell S, et al. The role of under-employment and unemployment in recent birth cohort effects in Australian suicide. *Soc Sci Med* 2013;93:155-62.
- Lundin A, Hemmingsson T. Unemployment and suicide. *Lancet* 2009;374:270-1.

- 22 Al-Mamun F, Kaggwa MM, Hosen I, *et al*. Suicide related to the COVID-19 pandemic in India: a systematic review. *Discov Psychol* 2023;3.
- 23 Skinner A, Osgood ND, Occhipinti J-A, *et al*. Unemployment and underemployment are causes of suicide. *Sci Adv* 2023;9:eadg3758.
- 24 ul Khaliq R. *Suicide rate up in Japan, doubles among unemployed*. Anadolu Agency, 2023.
- 25 Darity W, Goldsmith AH. Unemployment, social psychology, and unemployment hysteresis. *J Post Keynes Econ* 1993;16:55–71.
- 26 Kirkwood TB, Bond J, May C, *et al*. *Foresight. Mental Capital and Wellbeing Project: Mental capital through life: future challenges*. London: The Government Office for Science, 2008.
- 27 Franz W. *Hysteresis effects in economic models*. Heidelberg, 1990.
- 28 Laureys L. The cost of human capital depreciation during unemployment. *Econ J* 2021;131:827–50.
- 29 Occhipinti J-A, Buchanan J, Hynes W, *et al*. Estimating the mental wealth of nations: valuing social production and investment. *Nat Mental Health* 2023;1:247–53.
- 30 Occhipinti J, Tran K, Eyre H, *et al*. *The Value of Social Production in the United States: Measuring Mental Wealth*. Sydney, Australia: University of Sydney, 2023. Available: https://www.sydney.edu.au/content/dam/corporate/documents/brain-and-mind-centre/mental-wealth/the_value_of_social_production_in_the_united_states.pdf
- 31 Tran K, Occhipinti J, Buchanan J, *et al*. *A Contributing Life: A snapshot of the value of social production*. Sydney, Australia: The Brain and Mind Centre, University of Sydney, 2023.
- 32 Whittaker J, McLennan B, Handmer J. A review of informal volunteerism in emergencies and disasters: definition, opportunities and challenges. *IJDRR* 2015;13:358–68.
- 33 Wood L, Boruff B, Smith H. When disaster strikes... how communities cope and adapt: a social capital perspective. In: Johnson CD, ed. *Social capital: Theory, measurement and outcomes*. New York, USA: Nova, 2013.
- 34 Spear R, Erdi G, Parker MA, *et al*. Innovations in citizen response to crises: volunteerism & social mobilization during COVID-19. *Interface (Maynooth)* 2020;12:383–91.
- 35 Shaw R. Recovery from the Indian ocean tsunami. In: Shaw R, ed. *Post-Tsunami Recovery and Rehabilitation of Small Enterprises in Phang Nga Province, Southern Thailand*. Tokyo: Springer Japan, 2015: 487–503.
- 36 Winkelmann J, Webb E, Williams GA, *et al*. European countries' responses in ensuring sufficient physical infrastructure and workforce capacity during the first COVID-19 wave. *Health Policy* 2022;126:362–72.
- 37 Atkinson J-A, Vallye A, Fitzgerald L, *et al*. The architecture and effect of participation: a systematic review of community participation for communicable disease control and elimination. *Malar J* 2011;10:225.
- 38 Peace Corps. *The Peace Corps' Contributions to the Global Smallpox Eradication Program*. Washington DC, US: Peace Corps, 2016.
- 39 O'Higgins N. *Volunteer work and its links to the labour market experiences of young people*. Geneva, Switzerland: International Labour Organization, 2020.
- 40 Gouldner AW. The norm of reciprocity: a preliminary statement. *Am Sociol Rev* 1960;25:161.
- 41 Chisholm D, Sweeny K, Sheehan P, *et al*. Scaling-up treatment of depression and anxiety: a global return on investment analysis. *Lancet Psychiatry* 2016;3:415–24.
- 42 Landy FJ. *The psychology of work behaviour*. Comewood, CA, USA: Dorsey Press, 1985.
- 43 Wright TA, Cropanzano R. The happy/productive worker thesis revisited. *Res Pers Hum Resour Manag* 2007;26:269–307.
- 44 Isham A, Mair S, Jackson T. Worker wellbeing and productivity in advanced economies: re-examining the link. *Ecological Economics* 2021;184:106989.
- 45 Bloomberg. *Corporate Wellness Market Size Worth \$93.4 Billion by 2028*. Bloomberg, 2022.
- 46 Warhurst C, Mathieu C, Dwyer RE. *The Oxford Handbook of Job Quality*. Oxford: Oxford University Press, 2022.
- 47 Kim TJ, von dem Knesebeck O. Perceived job insecurity, unemployment and depressive symptoms: a systematic review and meta-analysis of prospective observational studies. *Int Arch Occup Environ Health* 2016;89:561–73.
- 48 Witte HD. Job insecurity and psychological well-being: review of the literature and exploration of some unresolved issues. *Eur J Work Organ Psychol* 1999;8:155–77.
- 49 Sverke M, Hellgren J, Näswall K. No security: a meta-analysis and review of job insecurity and its consequences. *J Occup Health Psychol* 2002;7:242–64.
- 50 LaMontagne AD, Too LS, Punnett L, *et al*. Changes in job security and mental health: an analysis of 14 annual waves of an Australian working-population panel survey. *Am J Epidemiol* 2021;190:207–15.
- 51 Amaglobeli D, Thevenot C. *Tackling inequality on all fronts*. Finance & Development, 2022.
- 52 Berik G, Rodgers Y van der M, Seguino S. Feminist economics of inequality, development, and growth. *Feminist Economics* 2009;15:1–33.
- 53 Waters HR, Hyder AA, Rajkotia Y, *et al*. The costs of interpersonal violence—an international review. *Health Policy* 2005;73:303–15.
- 54 Dustmann C, Fasani F. The effect of local area crime on mental health. *The Economic Journal* 2016;126:978–1017.
- 55 Zielinski DS. Child Maltreatment and adult socioeconomic well-being. *Child Abuse & Neglect* 2009;33:666–78.
- 56 MacLennan D, Ong R, Wood G. Making connections: housing, productivity and economic development: AHURI final report No.251. Melbourne, Australia: Australian Housing and Urban Research Institute Limited; 2015. Available: <http://www.ahuri.edu.au/publications/projects/p53035>
- 57 Eming Young M. From early child development to human development: investing in our children's future. Washington, D. C., USA World Bank; 2022. Available: <https://openknowledge.worldbank.org/handle/10986/13950>
- 58 Productivity Commission. *Mental health: productivity Commission inquiry report No.95*. Canberra, Australia Productivity Commission; 2020. Available: <https://www.pc.gov.au/inquiries/completed/mental-health/report>
- 59 Melluish S. Globalization, culture and psychology. *Int Rev Psychiatry* 2014;26:538–43.
- 60 Wiedmann T, Lenzen M. Environmental and social footprints of International Trade. *Nature Geosci* 2018;11:314–21.
- 61 Powell T, Billiot S, Muller J, *et al*. The cost of caring: psychological adjustment of health-care volunteers during the COVID-19 pandemic. *Traumatology* 2022;28:383–92.
- 62 Dean L, Churchill B, Ruppner L. The mental load: building a deeper theoretical understanding of how cognitive and emotional labor overload women and mothers. *Community Work Fam* 2022;25:13–29.
- 63 Occhipinti J-A, Buchanan J, Skinner A, *et al*. Measuring, Modelling, and forecasting the mental wealth of nations. *Front Public Health* 2022;10:879183.
- 64 Bank W. *World development report 2019: the changing nature of Work*. Washington, DC World Bank; 2019.
- 65 Buchanan J, Allais S, Anderson M, *et al*. The futures of work: what education can and cannot do. In: *Background paper for the UNESCO Futures of Education Initiative*. 2020. Available: <https://unesdoc.unesco.org/ark:/48223/pf0000374435>
- 66 Bowman A, Erturk I, Froud J, *et al*. *The end of the experiment? From competition to the foundational economy*. Manchester: Manchester University Press, 2014.
- 67 Foundational Economy Collective. *Foundational Economy. The Infrastructure for Everyday Life*. Manchester: Manchester University Press, 2018.
- 68 Calafati L, Froud J, Haslam C, *et al*. *When nothing works. From cost of living to foundational liveability*. Manchester: Manchester University Press, 2023.
- 69 Quiggin J. Inside story. 2020. Available: <https://insidestory.org.au/participation-income> [Accessed 17 Jan 2023].

Supplementary file: Building systemic resilience, productivity, and wellbeing: A Mental Wealth Perspective

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Expanded Table 1: Recommendations for building economic and business resilience.

Recommendations	Priorities
Invest in Brain Capital	<p>a. Build an innovation system and close the productivity distribution gap: The productivity slowdown across advanced economies is said to reflect not only a general decline in disruptive research and innovation (1) but also a growing gap between a relatively small cohort of high productivity, high skill ‘frontier firms’, which are constantly innovating, and a much larger group of low productivity ‘laggard’ firms, which have adapted to ‘business as usual’ (2). The case of Australia is instructive. Despite its outward appearance of economic resilience, the achievement of decades of continuous growth in GDP has been built on a fragile base. Its narrow trade and industrial structures are particularly narrow (3). While most businesses are not focussed on new-to-the-world innovations, an emphasis on supporting diffusion and uptake of business innovation could have broad productivity benefits (4) (Volume 5) as well as enhance mental capital and transferable skills.</p> <p>While the causes of the productivity slowdown continue to be subject of much debate, one thing is certain; it cannot be reversed without a massive increase in investment in research and innovation in the context of well-designed and purposeful national policy. Many countries have treated post-pandemic reconstruction as an opportunity for such investment, including the Biden administration in the US which is emulating the German Fraunhofer system in moving beyond the traditional linear ‘lab to market’ model of commercialisation to the development of ‘innovation ecosystems’ (5). Countries like Australia can reduce the fragility of their economic success if they pursue such an approach to achieve industrial transformation and the development of a more inclusive and dynamic knowledge-driven economy (6). Innovation is the key to greater resilience for businesses and workers in increasingly competitive global markets and value chains.</p> <p>Cognitive and relational competencies (interpersonal communication, teamwork, leadership) have always been important for ensuring best use is made of technological advances. Increasing levels of automation of nearly all aspects of production and shifts towards a knowledge-based economy make skills of this nature even more important (7-9). Productivity frontier firms (those in the top 10% of the productivity distribution) are up to eight times as productive as the least performing firms and have almost double the proportion of high skilled workers (8). Adjusting the skill structure (i.e., industry specific proportions of high, medium, and low skilled workers) to resemble frontier firms and enhancing the complementarities between manager and worker skills were on average estimated to deliver the largest gains in reducing the productivity gap (8). Achieving this in the current climate of substantial skills shortages will require innovation in vocational education and investments in building the mental capital of workers and retaining them.</p> <p>b. Innovations in vocational education and reinvestment in workforces: With automation taking over routine tasks and changing the nature of work, workers in both advanced and developing economies will need to possess more advanced skills, such as technological know-how, problem-solving, critical thinking, perseverance, collaboration, and empathy. The World Bank’s World Development Report on the Future of Work suggested that in countries with the lowest human capital investments, the workforce of the future will only be one-third to one-half as productive as it could be if people enjoyed full health and received a high-quality education (10). To become less vulnerable to impacts of productivity declines and skills shortages greater collaboration is needed between employers</p>

	<p>and educators to create a workforce that is adaptable to changing circumstances by mastering quality, transferable vocational skills (11, 12). For example, current labour markets and vocational education providers treat customer service, carer, and administrative support roles as unique domains of work. However, creating occupational structures that deepen transferable skills would enable people to move more easily between such related domains of work as opportunities rise and fall in different parts of the labour market (11, 12). Once core domain expertise and foundational capabilities that enable transferability of skills has been achieved, micro-credentialing has the potential to facilitate the transition between education and employment (13), promote employee upskilling and flexibility as the nature of work evolves, and improve access to education among disadvantaged populations (14). The shift to a focus on maximising shareholder value from the 1980s saw a re-allocation of company resources away from investment in building the mental capital, wellbeing, and productive capabilities of workers and towards more extractive practices that enriched investors (including company executives) such as stock repurchasing (15). Over the period 2004-2013, publicly listed companies on the S&P 500 bought back US\$3.4 trillion-worth of shares, equating to 51% of net income (15). This shift from a “retain-and-reinvest” to a “downsize-and-distribute” strategy is said to be largely responsible for rising income inequality, employment instability, and an erosion of innovation capacity seen since the 1990s (15-17). Companies will need to fashion a new social contract that reinvests in their workforces and provides workers with opportunities to engage in collective, stable, and cumulative learning over the course of their careers to reverse the destructive effects of the company resource re-allocation trend of the last 30 years.</p> <p>Under a narrow economic frame, ageing populations are also seen to present a potential productivity challenge (18). Research from Europe has shown that a 1% increase in the employed population aged 55 – 64 years is associated with a decrease in the productivity growth rate of approximately 0.1% to 0.5% (19). The so-called ‘issue of ageing populations’ is widespread and ongoing in nearly all of Asia (20). Researchers propose that the impact of ageing on productivity depends on the structure of the economy with more advanced, knowledge-based economies (dependent on accumulated mental capital, and relational and communication skills) being less exposed than those with a greater economic activity in labour-intensive sectors (19, 21, 22). Therefore, rights to further education in new domains of expertise as well as micro-credentialing contributes to an ecology for lifelong learning (23). This will be important for supporting transitions to knowledge-based economies and to maintaining productivity in the context of an ageing population and workforce. In addition, establishing workplace structures to foster intergenerational knowledge exchange will play an important role for both the adoption of innovation among older workers and the upskilling of younger workers. However, this narrow economic frame fails to recognise the changing nature of contributions made to society over the course of a person’s life. While the declining productivity of older adults in the formal economy is seen as a ‘productivity challenge,’ the Mental Wealth frame demonstrates that their contributions to social production are substantial (24).</p> <p>c. Invest in Brain Health Living Labs: Through public-private-people partnerships, Brain Health Living Labs would integrate contemporaneous clinical care, transdisciplinary research and innovation processes, expediting the development of well-designed, evidence-based brain health solutions across the lifespan (25, 26). Research and innovation should be inclusive of, but extend beyond clinical trials, to include the exploration of the most effective models of care, implementation strategies, and mental health system design. They should also focus on developing models of care aimed at improving social, vocational, and educational functioning (beyond only symptom reduction) and successful transitions to work (27).</p> <p>d. Fostering collective intelligence: Collective intelligence is an under-valued potential source of productivity and innovation. Based on the notion of ‘The Wisdom of Crowds’ (28), collective intelligence is the intelligence that emerges from group collaboration</p>
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	<p>that extends beyond the intelligence of individual group members. Collective intelligence has been shown to predict competitive performance in diverse settings, with the group interaction process being overall more important than the skill of individual group members (29-32). Gender composition of teams has emerged as a key influencing factor with collective intelligence positively correlated with female participation (31). In the post-pandemic era, business needs to move beyond a short-term focus on incentives to boost individual worker productivity and make longer-term investments in brain capital and the creation of work environments that foster collective intelligence as a pathway to enhancing innovation and adaptation.</p> <p>e. Revitalising the foundational economy: The COVID-19 pandemic reminded all societies of what was important in economic and social life. Even in lock-down certain sectors were exempt because societies cannot function without them. They were health, education, the food supply chains, and utilities (especially telecommunications). The pandemic also highlighted the importance of quality in essential social services – especially aged and disability care. Poor quality provision of such care was associated with some of the highest COVID-19-related death rates in many societies. Even before the pandemic a range of researchers had identified the importance of these sectors – what they describe as the Foundational Economy - as domains that provide the infrastructure for everyday life (33). Initiatives in innovation systems, vocational education, brain health living labs, and more effective approaches to collective intelligence can only achieve so much in isolation. To deepen Mental Wealth, they need a solid anchor in the form of an effective and robust foundational economy. For the last thirty years, programs of large-scale experiments with outsourcing, compulsory competitive tendering, and the creation of quasi-markets in education and human services have steadily hollowed out the quality of the infrastructure of everyday life (34). Unless the foundational economy is strengthened, the above initiatives will have limited impact. Just as a house built on sand may look good initially, flawed foundations will ensure anything built atop will falter.</p>
<p>Programs to guard against mass unemployment</p>	<p>Mass unemployment as a result of large-scale natural disasters, pandemics, financial crises, civil disruption, etc. has devastating effects on the social fabric of nations, on the vocational and educational potential of young people, and on the cognitive and emotional resources that underpin productivity and future national prosperity. Even when economies recover, mental capital depreciation (dependent on the duration of unemployment and the extent of former and new occupational mismatch), social dislocation, and mental health outcomes resulting from the mass unemployment event can have lasting effects, incurring significant losses to a nation's productive potential and social prosperity. Traditionally, increasing physical infrastructure investment has been a key strategy of governments to stem the rapid deceleration of productivity and stimulate the economy. However, this strategy doesn't prevent the damage from mass unemployment. It merely aims to reduce the duration of the downturn and benefits some sectors over others.</p> <p>During the COVID-19 pandemic, governments of Australia, Germany, France, Italy, Japan, the US, and others proactively responded to prevent mass unemployment through job retention programs. These programs preserved the connection of workers and employers by maintaining viable jobs during the temporary reduction in business activity. They buttressed aggregate demand by supporting incomes of workers on reduced hours (35). By May 2020, an unprecedented 50 million jobs across OECD countries were supported by such job retention programs (35). Even prior to the pandemic several countries already had short-time work (STW) schemes in place that provided support to individual businesses facing temporary declines in demand but considered viable in the medium term. These schemes help to avoid the costly process of separation, re-hiring, and training, reduce aggregate job destruction rates and deadweight losses, and improve the likelihood of business survival (36, 37). Beyond the benefits to business</p>

	<p>and the economy, job retention schemes during the pandemic likely acted to reduce the mental health corollaries of unemployment. In Australia, systems modelling of the impact of the pandemic on mental health estimated that the employment retention program, JobKeeper, will have contributed to the prevention of 469 suicide deaths, 4,226 self-harm hospitalisations, and 51,490 mental health-related ED presentations over the period 2020-2025 and represented the single most effective mental health intervention among the programs modelled at the height of the pandemic (38, 39). However, economic downturns do not affect all groups equally, being particularly harsh for those reliant on casual work, those developing new skills, and those without accumulated assets, experience, or independent social networks. Job retention schemes should include these most vulnerable groups. A corporate co-contributions program could be considered to support the funding of such schemes.</p> <p>It is also important to note potential drawbacks of a universal application of job retention schemes during significant economic downturns in achieving progress towards a productive Wellbeing Economy. Economic downturns have been known to catalyse creative destruction in the economy to achieve progress towards new goals. For example, travel restrictions and lockdowns during the COVID-19 pandemic drastically reduced overall global energy demands due to reduced commercial and industrial sector activity, while domestic consumption increased significantly (40). The economic crisis that accompanied the pandemic therefore provided a window of opportunity to hasten the transition towards renewable energy sources (40). More broadly, recessions have been associated with an increase in the share of renewable energy particularly in countries with stringent environmental protection regulation (40). Therefore, the green transition has required several fossil-fuel intensive industries to decarbonise with the loss of associated jobs in favour of green jobs. While difficult trade-offs may therefore need to be made regarding the implementation of job retention schemes, appropriate planning for a resilient transition in such cases can support workforce reskilling rather than requiring recession to catalyse a step change to new goals in society's best interest.</p>
Foster social productivity	<p>Technological disruption and the changing nature of work also requires rethinking the social contract. We need new ways to invest in people and to protect them, regardless of their employment status. Yet four out of five people in developing countries have never known what it means to live with social protection (41). With 2 billion people globally already working in the informal sector, unprotected by stable wage employment, social safety nets, or the benefits of education, new working patterns are adding to a dilemma that predates the latest innovations (41).</p> <p>Given the detrimental impacts of income insecurity and unemployment on brain capital and national productive potential, the past decade has seen increasing calls for initiatives to prevent deprivation and enforced idleness, such as the Universal Basic Income (UBI) and the Job Guarantee (JG). The UBI is a government safeguard to ensure all citizens can receive unconditionally a liveable income as a means of eliminating income insecurity and preventing poverty (42). These sorts of unconditional cash transfers have been found to positively impact mental health, wellbeing, and intergenerational rates of substance use (43). However, critics of the UBI fear that it is inherently inflationary (44), and its lack of connection to productive activity may act as a demotivator to participation in society, potentially undermining social cohesion and exacerbating social decay (45). In contrast, the JG is a commitment to achieving full employment where governments act as an employer of last resort and provide full-time or part-time jobs to everyone that desires one with an income at the level of a living wage (46). This is said to create a fixed-wage 'buffer stock' of workers (as opposed to an unemployed buffer stock) that expands and declines based on private sector demands (47). However, critics of the JG argue it represents a massive expansion of government, that it will interfere with the functioning of free</p>

	<p>markets, that it would create large, inflexible, inefficient public programs, and that it would present substantial operational challenges (48, 49).</p> <p>A Participation Wage represents an alternative to a UBI or JG. The Participation Wage is similar to the JG in that it provides a living wage to those that are unemployed, underemployed, or not participating in the formal economy, but are participating in socially productive activities (50). As mentioned previously, such activities could include volunteering and charity work, contributions to community groups, educating and caring for children, care of the sick, elderly or disabled, informal mentoring, environmental restoration, building social infrastructure such as facilities, spaces, services and networks, and any activity that is currently unpaid, socially valued, and contributes to strengthening civic life (51). There are several advantages of the Participation Wage; (i) it would strengthen the systemically under-resourced community sector, (ii) rather than government determining the parameters of available work, it is driven by the nature of social contributions that people deem to be most meaningful to them, (iii) it represents a shift in the meaning of work that is more inclusive, (iv) it is far more flexible in being able to respond to the dynamics of social, economic, and environmental change, and (v) it would alleviate those concerned about the expansion of an alternative public sector market that competes with private industry. The Participation Wage is not a welfare payment, it is an investment in social productivity, which has benefits for economic productivity and contributes to multi-sector resilience. From the perspective of an aging population, the Participation Wage would provide an alternative or supplement to the aged pension and incentivise continued social participation in retirement, delivering transgenerational benefits and a maintenance of mental capital, mental health, and collective wellbeing.</p> <p>The participation wage would not be available to those in full-time employment; however, tax incentives could be provided to those that make social contributions in addition to participating full-time in the formal economy. Finally, compliance measures for the Participation Wage should reflect standard operational requirements of tax systems i.e., self-assessment subject to auditing, rather than the draconian compliance rules of current welfare systems (50). In addition, tax incentives could be offered to promote private sector investments in the opportunity structures that enable social productivity and social connectedness such as facilities, spaces, services, and networks. Civic infrastructure broadens participation and provides a foundation for inclusivity, trust building, and a shared sense of responsibility, without which, other more polarising interests ‘will fill the vacuum’ and undermine resilience (52-54).</p>
<p>Establish a legal framework for resilience</p>	<p>The Mental Wealth perspective on economic resilience focuses on building brain capital and the infrastructure to support economic and social productivity to enable a system to anticipate, absorb, recover from, and adapt to a wide array of systemic threats. However, the extent to which cross-system resilience is considered an essential state of being will determine the appetite for legislative changes to secure it. For example, in a number of countries electricity systems are resilient by law with reserve capacity mandated should threats to national or local systems arise (54). Similarly, a legal framework to support a universal, guaranteed minimum level of social productivity and social capital infrastructure would better secure this essential source of surge capacity to respond to local, national, and global threats.</p> <p>The pandemic provided a compelling case supporting the argument that governments have an ethical mandate to intervene to protect individuals and populations at risk of demonstrable harm, whereby the failure to act would result in increased levels of illness and health inequalities, and social deterioration (55). However, imposing obligations on individuals to curtail their activity to protect the best interests of others can put public health law at odds with human rights law (56) and may not be particularly</p>

	<p>effective in countries that give primacy to individualism over collectivism. The pandemic demonstrated the anti-government sentiment and civil unrest that can manifest where individualised and polarized communities meet with the implementation of legal instruments to curtail individual freedoms, even temporarily (57). Therefore, legislative changes may best be focussed on reforms such as ending unhelpful subsidies, improving labour market regulations, globally overhauling taxation policies, and more broadly re-designing social and economic structures to better support economic resilience, reduce inequalities, enhance social cohesion, building trust and a sense of shared responsibility. Enabling a nation's Mental Wealth to flourish requires collaborative efforts of a complex network of people and organisations in the public and private sectors, as well as an alignment of policy and practice of governmental agencies at the national, state, and local levels. In this sense, the law is an essential tool for creating the conditions to support business resilience and the social conditions that would empower people to lead healthier and safer lives (55).</p> <p>In addition, just as environmental, social, and governance (ESG) frameworks need to add health and wellbeing to their focus (58, 59), a resilience framework would prioritize brain capital. It would also recognize the essential reskilling and upskilling requirements that are needed to help individuals and organizations adapt to a changing world. This framework would encompass an adaptive supply chain, with technology serving as an enabler, and deploy financial and fiscal buffers as defensive supports within an overall proactive stance.</p> <p>Inaction is always more costly than prevention. A resilience legal framework would foster the cooperation of public and private sector organizations in supporting sustainability and inclusiveness across societies. For companies, resilience will translate into sustainable business growth, while for societies, resilience both enables and depends on inclusive and sustainable economic prosperity emphasizing improved quality of life. By prioritizing brain capital, by fostering cooperation between public and private sectors, and by promoting resilience thinking at multiple scales (organisational, community, regional, national), a resilience legal framework could help build a more resilient, stable, and secure world for all.</p>
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References:

1. Park M, Leahey E, Funk RJ. Papers and patents are becoming less disruptive over time. *Nature* 2023;613(7942):138-44.
2. Andrews D, Criscuolo C, Gal PN. Frontier firms, technology diffusion and public policy: Micro evidence from OECD countries. Paris, France: OECD: <https://www.oecd.org/economy/growth/Frontier-Firms-Technology-Diffusion-and-Public-Policy-Micro-Evidence-from-OECD-Countries.pdf> 2015.
3. Andrews D, Hambur J, Hansell D, et al. Reaching for the stars: Australian firms and the global productivity frontier Canberra: The Australian Government the Treasury: <https://treasury.gov.au/sites/default/files/2022-02/p2022-243535.pdf>; 2022.
4. Productivity Commission. 5-year Productivity Inquiry: Advancing Prosperity. Report no. 100; Volume 5: 7 February 2023. Canberra: Australian Government; 2023.
5. O'Brien C, Fikri K. House and Senate China Competition Bills, Dueling Theories of How Innovation Happens—and Some Agreement Washington, D. C.: Economic Innovation Group: <https://eig.org/dueling-theories-of-innovation/> 2022 [
6. Green R. Innovation and industry policy in a changing world. *Interdisciplinary Journal of Economics & Business Law* 2022;11(4).
7. Spitz-Oener A. Technical Change, Job Tasks, and Rising Educational Demands: Looking outside the Wage Structure. *Journal of Labor Economics* 2006;24(2):235-70.
8. Criscuolo C, Gal P, Leidecker T, et al. The human side of productivity: Uncovering the role of skills and diversity for firm productivity. Paris, France: OECD: <https://doi.org/10.1787/24139424>; 2021.
9. Barley SR. Work and Technological Change. Oxford: Oxford University Press; 2020.
10. World Bank. World Development Report 2019: The changing nature of work. Washington, DC: World Bank; 2019.
11. Buchanan J, Hickie I, Occhipinti J. Mental wealth and jobs: without it, we're just pouring water into a leaking bucket. *The Conversation*, 1st September 2022 2022.
12. Buchanan J, Allais S, Anderson M, et al. The futures of work: what education can and cannot do. Background paper for the UNESCO Futures of Education Initiative: <https://unesdoc.unesco.org/ark:/48223/pf0000374435>. 2020.
13. Maina MF, Guàrdia Ortiz L, Mancini F, et al. A micro-credentialing methodology for improved recognition of HE employability skills. *International Journal of Educational Technology in Higher Education* 2022;19(1):10.
14. McGreal R, Mackintosh W, Cox G, et al. Bridging the Gap: Micro-credentials for Development: UNESCO Chairs Policy Brief Form - Under the III World Higher Education Conference (WHEC 2021) Type: Collective X. *International Review of Research in Open and Distributed Learning* 2022;23(3):288-302.
15. Lazonick W. Stock buybacks: From retain-and-reinvest to downsize-and-distribute. Center for Effective Public Management: Brookings Institution: <https://www.brookings.edu/wp-content/uploads/2016/06/lazonick.pdf>; 2015.
16. Brenner R. The Economics of Global Turbulence. The Advanced Capitalist Economies from Long Boom to Long Downturn, 1945 – 2005. Brooklyn, New York: Verso Books; 2006.
17. McDonald D. The Golden Passport. Harvard Business School, the Limits of Capitalism, and the Moral Failure of the MBA Elite. New York: Harper Business; 2017.
18. Lock SL. The benefits of brain health to our economies. *Nature Aging* 2023;3(1):1-2.
19. Calvo-Sotomayor I, Laka JP, Aguado R. Workforce Ageing and Labour Productivity in Europe. *Sustainability* 2019;11(20):<https://doi.org/10.3390/su11205851>.
20. Lee SH, Mason A, Park D. Why does population aging matter so much for Asia? Population aging, economic growth, and economic security in Asia. Manila, Philippines: Asian Development Bank; 2011.
21. Shekhar A, Ebeke C, Shao X. The Impact of Workforce Aging on European Productivity: IMF Working Paper WP/16/238. Washington, D. C., USA: International Monetary Fund; 2016.
22. Skirbekk V. Age and productivity capacity: Descriptions, causes and policy options. *Aging Horizons* 2008;8:4-12: <https://pure.iiasa.ac.at/id/eprint/8588/>.
23. Brown M, Mhichil MNG, Beirne E, et al. The Global Micro-Credential Landscape: Charting a New Credential Ecology for Lifelong Learning. *Journal of Learning for Development* 2021;8(2):228-54.
24. Tran K, Occhipinti J, Buchanan J, et al. A Contributing Life: A snapshot of the value of social production. Sydney, Australia: The Brain and Mind Centre, University of Sydney; 2023.
25. Eyre HA, Sinha A, Smith E, et al. The Brain Economy. *RSA Journal* 2020;Issue 3: https://www.oecd.org/naec/naec-in-the-news/RSA_The_Brain_Economy.pdf.
26. Brain and Mind Centre. Brain and Mind Centre: Transforming brain and mind health with world-leading research Sydney, Australia: The University of Sydney; 2023 [
27. Hickie IB, Scott EM, Cross SP, et al. Right care, first time: a highly personalised and measurement-based care model to manage youth mental health. *Med J Aust* 2019;211 Suppl 9:S3-S46.
28. Surowiecki J. The wisdom of crowds: Why the many are smarter than the few and how collective wisdom shapes business, economics, societies, and nations. New York, NY, US: Doubleday & Co; 2004. xxi, 296-xxi, p.

29. Woolley AW, Chabris CF, Pentland A, et al. Evidence for a Collective Intelligence Factor in the Performance of Human Groups. *Science* 2010;330(6004):686-8.
30. Woolley AW. Assessing collective intelligence in human groups. *AI and the Future of Skills, Volume 1: Capabilities and Assessments*. Paris, France: OECD Publishing; 2021.
31. Kim YJ, Engel D, Williams Wooley A, et al. What Makes a Strong Team? Collective Intelligence Predicts Team Performance in League of Legends. *Academy of Management Journal* 2017;<https://doi.org/10.5465/ambpp.2016.13564abstract>.
32. Riedl C, Kim YJ, Gupta P, et al. Quantifying collective intelligence in human groups. *Proceedings of the National Academy of Sciences* 2021;118(21):e2005737118.
33. Arcidiacono D, Barbera F, Bowman A, et al. *Foundation economy: the infrastructure of everyday life*. Manchester: Manchester University Press; 2018.
34. Bowman A, Erturk I, Froud J, et al. *The end of the experiment? From competition to the foundational economy*. Manchester: Manchester University Press; 2014.
35. OECD. *Job retention schemes during the COVID-19 lockdown and beyond*. Paris, France: OECD; 2020.
36. Osuna V, García-Pérez JI. On the Effectiveness of Short-time Work Schemes in Dual Labor Markets. *De Economist* 2015;163(3):323-51.
37. Landais C, Giupponi G. VOX EU: <https://cepr.org/voxeu/columns/building-effective-short-time-work-schemes-covid-19-crisis>. 2020. [cited 17/01/2023].
38. Occhipinti J, Ho N, Skinner A, et al. Lives saved by supporting jobs in 2020 and beyond. https://www.sydney.edu.au/content/dam/corporate/documents/brain-and-mind-centre/youth-mental-health/yymh_briefingnote_revised_bmc_systemsmodelling.pdf. Sydney, Australia: Brain and Mind Centre, The University of Sydney; 2021.
39. Atkinson J, Skinner A, Lawson K, et al. Revision of estimates based on revised RBA forecasts. Sydney, Australia: Brain and Mind Centre, The University of Sydney: <https://www.sydney.edu.au/content/dam/corporate/documents/brain-and-mind-centre/revision-of-estimates-based-on-revised-rba-forecasts.pdf>; 2020.
40. Deb P, Furceri D, Ostry JD, et al. Creative Destruction During Crises - An Opportunity for a Cleaner Energy Mix. *IMF Working Papers* 2021;2021(284):A001.
41. International Labour Organisation. *World Social Protection Report 2020-22: Social Protection at the Crossroads - in Pursuit of a Better Future*. Geneva: ILO; 2021.
42. Bregman R. *Utopia for realists*: Bloomsbury Publishing; 2018.
43. West S, Castro AB, Doraiswamy PM. Recurring cash transfers to enhance the mental wellbeing of Americans. *Nature Mental Health* 2023;Accepted, in production.
44. Mitchell W, Watts M. A comparison of the macroeconomic consequences of Basic Income and Job Guarantee schemes. *Rutgers Journal of Law & Urban Policy* 2005;2(1):64-90.
45. Goldin I. Five reasons why universal basic income is a bad idea. *Financial Times* 2018.
46. Mitchell WF. The Buffer Stock Employment Model and the NAIRU: The Path to Full Employment. *Journal of Economic Issues* 1998;32(2):547-55.
47. Mitchell W, Mosler WB. Fiscal policy and the job guarantee. *Australian Journal of Labour Economics* 2002;5(2):243-59.
48. Dennis M. The Full Employment Road to Socialism: The Job Guarantee Movement of the 1970s and the Challenge to Capitalism. *Socialism and Democracy* 2021;35(2-3):129-48.
49. Triggs A. 2020. [cited Accessed 17/01/2023].
50. Quiggin J. Inside Story: <https://insidestory.org.au/participation-income/>. 2020. [cited Accessed 17/01/2023].
51. Occhipinti J, Buchanan J, Hynes W, et al. Estimating the Mental Wealth of Nations: Valuing social production and investment. *Unpublished (under review, Nature Mental Health)* 2023.
52. Blair J, Kopell M. *21st Century Civic Infrastructure: Under Construction*. The Aspen Institute: <https://aspencommunitysolutions.org/wp-content/uploads/2013/06/21st-Century-Report-FINAL-NoBlanks.pdf>; 2015.
53. Charron N, Lapuente V, Rodríguez-Pose A. Uncooperative society, uncooperative politics or both? Trust, polarization, populism and COVID-19 deaths across European regions. *European Journal of Political Research* 2022.
54. Hynes W, Trump B, Love P, et al. Bouncing forward: a resilience approach to dealing with COVID-19 and future systemic shocks. *Environment Systems and Decisions* 2020;40(2):174-84.
55. Gostin LO, Gostin KG. A broader liberty: J.S. Mill, paternalism and the public's health. *Public Health* 2009;123(3):214-21.
56. Martin R. The limits of law in the protection of public health and the role of public health ethics. *Public Health* 2006;120 Suppl:71-7; discussion 7-80.
57. Institute for Economics & Peace. Sydney, Australia: IEP. 2021.
58. Williams MA, Geli P. <https://fortune.com/2022/03/14/esg-is-not-enough-time-to-add-health-wellbeing-csr-workers-pandemic-leadership-geli-williams/>; Fortune. 2022. [cited 18/03/2023].
59. Staglin G. Why ESG Metrics & Strategies should include mental health. *Forbes* 2021.