Perspectives on the Future of Growth

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Perspectives on the Future of Growth

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Abstract: In this last paper in a series of four, we will enquire into key developments affecting economic growth in the near future, consider potential restructuring effects that current and future economic events could cause and survey suggestions from literature for long-term sustainability of growth trends. Discussing climate change, COVID-19 economic recovery, automation, and future growth with a view to global development, we explore where growth may take economies, and how we may foster growth in a rapidly changing international economic landscape.

Keywords: introduction to economic growth; future of growth; crises and growth; UK growth

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1. Introduction

Purpose of the paper. Our foremost goal is to offer concise, non-specialist coverage of economic growth and its contribution to transforming the world. How better to tell its story than through the lens of the world's first growing economy?

For our final paper in a series of four, we voyage into the unknown: the future. In this paper we present the predicted economic costs of climate change and survey the deficiencies in quantifying these costs. As we write, the deep recessionary effects of the COVID-19 pandemic are still at the forefront of the global economy. We assess the recovery of growth and consider areas of economic uncertainty as we exit the pandemic.

We also review the economic lessons from international comparisons of managing the impact of the virus on health, society, and the economy. In our third restructuring event, we view the potential impacts on the labour market of automation—it may not prove to be the Armageddon that people fear, but it will require new avenues for education and skilling of the population to ensure labour market adaptability.

Throughout these discussions, we highlight areas for progress in economic research and policy. As we look to the future, there are gaps in our understanding. We invite you to delve deeper into these lines of enquiry to push boundaries of crisis management and strategies for sustained future growth. For the paper's curtain call, we reflect on the themes of growth, crisis, and inequality, and turn to discussions on the future form of economic growth.

We emphasise that economic growth can provide us with the much-needed wealth to confront future challenges and improve standard of living in developing economies, provided growth is inclusive and sustainable. Lastly, we highlight discussions surrounding the suitability of GDP as a representative measure of an economy's health, presenting arguments from literature for emissions-adjusted GDP and happiness as a metric of an economy's well-being, concluding that a 'dashboard' of indicators may best represent economies that are diverse internationally and diverse within themselves.

Over the previous three papers in this series, we have learnt that economic growth has drastically increased standard of living in the UK, industrialisation has spread globally, and with it technology has undergone massive transformation as nations innovate for future growth. Going first has not been easy, however. The UK has struggled with persistent

poverty and inequalities, and recurrent crises have taken a toll. The future will bring many more challenges.

This essay is structured as follows. Section 2 describes the likely effects of global warming on economic growth. Section 3 looks at the COVID-19 pandemic's impact. Further considerations on the long-term outlook of economic growth are in Sections 4 and 5 where we consider the impact of automation in particular and post-industrial growth in general. Sources for each section are collected at the end of this paper.

2. Climate Change

To curb global warming to 1.5 degrees Celsius above pre-Industrial levels, the temperature stipulated by the Paris Agreement to prevent permanent ecological damage in critical areas, the Intergovernmental Panel on Climate Change (IPCC) states that global carbon neutrality must be achieved by 2050, whilst global human-caused carbon emissions must be almost halved by 2030. However, much irreversible damage is already in progress. Carbon dioxide emissions are retained in the atmosphere for 300–1000 years. This section draws on the references [1–6].

As industrialisation has spread and global GDP has risen, carbon dioxide in the atmosphere has been growing at a faster rate. Beyond two degrees Celsius of warming, many ecological boundaries are crossed, with projections indicating a major breakdown of the planet's critical systems. Weather systems will exhibit greater variability and unpredictability. Climatic events will become more extreme and begin to affect new areas. The routine structures of societies and economies will radically alter and markets will become difficult to coordinate. To mitigate these effects, we will need to change our approach to economic growth.

Two socio-economic factors significantly impact an economy's vulnerability to climate change: sensitivity to climate events and adaptive capacity. Alex Bowen, Sarah Cochrane, and Samuel Fankhauser highlight: 'Economic growth almost always increases the adaptive capacity of people. A society's ability to cope with climate events is highly correlated with basic development indicators such as income, education and institutional quality.' Growth is adaptable to scarcity and access to economic growth improves economic flexibility to absorb climate events, through providing wealth to invest in infrastructure to protect against climate effects, to reconstruct in the event of sudden climatic catastrophe and improve adaptive capacity.

2.1. What Are the Likely Effects on Economic Growth?

Without appropriate mitigation strategies, climate change could be significantly damaging to economic growth and economic function. Studies have identified that extreme climatic events pose a significant threat to GDP per capita, and growth rates can be permanently impacted. As climate change intensifies climatic cycles and imposes unpredictability and variability, long-term strategy for sustained economic growth may become difficult.

As a result, innovations and human capital accumulation decrease, negatively impacting on future productivity, hence growth. This will make the future economy more vulnerable to expensive shocks to infrastructure and drastic market reform, as it will be difficult to maintain sufficient national wealth to finance future economic crises. The 2007–2008 Financial Crisis and subsequent recession demonstrated that globalised markets are vulnerable to macroeconomic volatility.

Although international trade reduces reliance on domestic networks, globalisation can create channels through which economic distress can spread. Extreme, prolonged climatic events can infiltrate financial markets and paralyse financial systems. International market distress could freeze credit markets at a time when large fiscal stimulus is required for economic and physical reconstruction. Trends in capital flight—which could intensify in the event of an international shock—could endanger domestic economic shock absorption capability. Compounding fiscal pressure (due to trade deficits or fiscal consolidation

policies) with drops in national income induced by climate events could reduce stimulus adaptability to regenerate.

Climatic events will likely cause economic restructuring effects and scarring, altering unemployment rates, investment levels, and trade connections, permanently affecting productivity. Rebound growth from economic crisis may not be able to regain macroeconomic stability. If shocks are recurrent or the productivity slowdown is too great, a nation may not accumulate sufficient wealth to implement long-term strategies for growth that require upfront investment.

Bowen et al. comment that 'if the frequency of extreme events passes some threshold, economies can fall into a downward spiral' where there are not sufficient resources to prevent further decline. Without long-term labour market reform and productivity mechanisms, climate change could create sudden reform, creating scarring effects, stifling future growth, and widening inequalities.

Climate change may make current business models unfeasible, causing the destruction of assets or the shifting of investment schedules. Wrongful specialisation of the labour force (due to time constraints and short-term market requirements) reduces human capital transferability and employment adaptability, increasing unemployment and reducing productivity. Adaptations become reactive, such as forced migration, as policy that may not be most beneficial in the long-term prevails.

Climate resilience will require strong long-term strategy to recover from past crises with sufficient availability of funds for government spending in order to mitigate permanent scarring effects. Bowen et al. identified that infrastructure resilience is a policy priority, to ensure the economy and the physical structure of society is equipped to confront the worst. This imposes a large upfront investment, however, if the long-term economy is protected through adequate policy to protect economic function in the event of future crises, this cost can be expensed over many years. The ability to coordinate the economy by employing underutilised resources and labour can mitigate long-term impacts of temporary disaster.

2.2. Measuring the Economic Effects of Climate Change

To inform long-term policy decisions, it is necessary to quantify the impact climate change will have on an economy. A current popular mechanism to quantify the 'cost' of climate change is the social cost of carbon, which is discounted present value of damages from one additional ton of carbon dioxide emitted.

Damage functions map a simulated future environmental impact (such as rising temperature) into an economic outcome. The social cost of carbon is calculated as the difference between a future where the climate effect is predicted to occur as a result of present emissions, and the trend value that would occur if today's action (producing carbon dioxide emissions) is not taken. Economists calculate the social cost of carbon to inform policy surrounding fuel economy standards, standards for equipment, such as air conditioning and for regulating greenhouse gas emissions.

The specification of the damage function is crucial as it will influence the effects one predicts as a result of the climate. Further, models that focus on the average predicted course of events will not acknowledge the drastic one-off events that pose the greatest risk to permanent growth scarring and productivity slowdowns. There is variability in results depending on the choice of discount rate, time horizon over which to measure damages, the model specification used to predict the economic outcome and whether to encompass local or global damages.

Quantifying the economic effects of climate change is difficult due to the dynamic human responses to climate change. As climatic events begin to influence people's way of life, individuals and communities will likely begin to adapt. These factors are significant as policy and infrastructure decisions must be future-looking.

Preparing the economy for climate change relies on estimation of how the economy will look when significant climate change effects emerge. How people react to a changing climate alters the climate impact of their behaviour, such as increasing use of air condition-

ing in response to rising temperatures, which, in turn, can contribute to higher emissions. Adaptive possibilities have huge variability. Developing and developed economies have different options available to adapt, having different effects on the climate.

There is a cost of adaptation—assuming costless adaptation could predict adaptive behaviour that does not materialise in reality due to large upfront costs to adapt. In the long-run there is generally more flexibility to adapt, however some adaptations may only be available in the short-run and adopting these for the short-term becomes unsustainable in the face of persistent changes in the local environment.

There will be more data for certain sectors and certain regions—regions with fewer data (on both weather and behaviour) will have more estimation variability in predicted outcomes than areas with more data. The aggregate adaptation response is difficult to accurately predict, therefore it is difficult to determine the policy that will be required to create the best-case future scenario.

Despite many projections on the climatic effects of climate change, Maximilian Auffhammer remarked in 2018 that the 'public resources targeted at understanding how these physical changes translate into economic impacts are disproportionately smaller'. There is a need for an increase in the intensity of research in translating environmental effects into economic effects, to inform policy.

People act as a result of what they expect to happen, and adapt based on their expectations of the future, however, statistical and econometric analysis are based on historical data. Major events that do not appear in historical data are difficult to model. However, drastic events are predicted to have the most serious societal and economic impacts. Currently, efforts involve incorporating short-term impacts of previous climate events and assuming that these responses would remain comparable to future climate events.

If significant structural change occurs as time progresses, however, models could misestimate the future outcome. We understand too little about the future of society to superimpose simulations of the changing climate to accurately determine what the socio-economic effects of climate change will be. Further, we do not know the significant changes in technology that may occur.

Economic models will need to develop to encompass possible predictions of events that have never happened before. Auffhammer suggests that greater economic focus is needed to incorporate the effects of adaptations to climate events, improve measurement of welfare impacts and advance 'sectoral and spatial coverage of the damage functions' (i.e., to build models representative of wider geographical and industry areas to estimate aggregate effects). He describes the quantity of work thus far on the 'effect of climate on nonmarket goods other than mortality' as 'shocking'. He suggests that greater collaboration between economists, climate scientists, business strategists, and supply chain experts is necessary to better predict the collective impact of major catastrophic climate events.

3. COVID-19

The COVID-19 pandemic has caused significant disruptions to the global economy. However, large-scale global crises are expected to become more frequent with pressures, such as climate change. As the world transitions into economic growth recovery over the coming years, it will be important to show caution towards potential economic shocks in the near future and learn from the pandemic response to best inform future policy in the event of similar events. This section draws on the references [7–14].

3.1. What Will Growth Recovery Look Like?

The recovery of economic growth is predicted to be asymmetric, both within nations and internationally. In the period before the virus is eliminated globally, the long-term economic growth prospects on a global scale will be uneven and biased towards strong economies. Economic growth rates as the UK exits the pandemic are expected to be record-breaking by historical standards.

The easing of restrictions and vaccine rollout are predicted to create an economic resurgence led by consumer expenditure, forging promising short-term economic outlooks. Conversely, pre-COVID GDP per capita levels are expected to persist in some developing economies for extended periods, despite strong growth in some economies. However, due to uneven levels of fiscal support and vaccination rollouts internationally, it is expected that developing economies may suffer greater scarring effects such as unemployment, disruption of human capital accumulation, debt, and reduced capacity for investment.

Countries that are unable to complete a vaccine rollout will struggle to initiate rebound growth, which will impact international growth prospects. Reductions in investment, innovation, and macroeconomic stability in the least developed economies are expected to reduce growth to the extent that it will be difficult to offset the economic contractions of 2020.

3.2. What Should We Look Out For in the Post-Pandemic Economy?

As government support schemes diminish, there is expected to be persistent trends in youth unemployment and uneven recovery in sectors most affected by the pandemic, such as hospitality and customer-facing services. The British Chambers of Commerce emphasises: 'Beyond the strong short-term outlook, notable economic scarring from the pandemic is projected to weigh on economic activity once government support winds down and drive an uneven recovery across different sectors and groups of people'.

Once the surge in consumer demand is exhausted, unviable business models may be exposed. Business investment is expected to increase sharply due to growth in consumer demand, however as the 'super-deduction' (a government scheme to enable businesses to experience a tax-cut if they invest) ends, business investment is predicted to 'slow sharply in 2023' (British Chambers of Commerce), which could reduce long-term growth.

3.2.1. Furlough

From July 2021, the UK furlough scheme began to taper, with its end date set for September 2021. As the furlough scheme ends, the UK economy will begin to witness how many jobs are still available, and how many workers become unemployed due to job losses during the pandemic (previously masked by the furlough scheme).

As customer-based services are predicted to experience slow rebound growth, it is expected that unemployment may rise as the furlough scheme ends. In September, temporary increases to Universal Credit will be removed. The Institute for Fiscal Studies (IFS) highlights that the transition from furlough to unemployment could present a large drop in income, given that furlough was based on previous employment earnings, whereas Universal Credit is means-tested on current household earnings.

The support available through Universal Credit will vary depending on the household, creating large discrepancies in individuals' incomes, even if pre-COVID individuals earned the same. Individuals who become unemployed but have significant assets or a higher-earning household member will be eligible for little or no Universal Credit. Higher levels of jobseekers' allowance are available for six-months after unemployment, however if unemployment is prolonged, some unemployed workers will experience a decline in earnings.

The IFS notes that the extent to which these government services will be required when furlough ends is as yet unknown, however if middle to high earners, and individuals with household income above the threshold for Universal Credit transition into unemployment, they will experience a drop in earnings. This could significantly impact future employment opportunities, skills training and investments, delaying the scarring effects from the pandemic. Further, reduced earnings could diminish consumer expenditure, causing declines in aggregate demand, reducing, or reversing, the positive growth trends of the early post-pandemic recovery.

3.2.2. Corporate Debt

Since the 2007–2008 Financial Crisis, corporate bond issues have increased internationally. Although this can improve access to financing for company growth, monitoring the quality of corporate debt was identified as a concern prior to the pandemic to prevent debt overhang in the event of a crisis. Riskier bonds were on the rise, with a large uptake of corporate debt in developing economies (accounting for two-thirds of corporate debt growth between 2007 and 2018) and debt extending to smaller firms in developed economies.

There were fears that an interest rate rise could expose vulnerabilities, increasing the risk of default. During the pandemic, fiscal and monetary response from governments injected large stimulus in the private sector, reducing firm bankruptcy rates across OECD economies and key emerging markets, even though major sectors (mainly customer facing services, energy, and transportation) experienced significant contraction and debt build-up.

Damien Puy and Lukasz Rawdanowicz identify 'High corporate debt tends to reduce investment in the aftermath of economic crises, with negative implications for the recovery'. As such, debt overhang could negatively impact post-pandemic future economic growth. The large public stimulus to corporate firms could mask deficiencies in some sectors, artificially maintaining business operations for failing firms.

There is fear that government stimulus could create a wave of 'zombification' as propped up firms create drag against growth potential ('zombies' increased following the 2008 Financial Crisis and were identified as limiters to UK economic growth). Although the rise in 'zombies' has not yet been observed, it could emerge as the economy exits the pandemic, especially if consumer demand has permanently shifted away from certain sectors.

Policy during the pandemic has largely protected firms that issue risky debt, preventing insolvency—there is concern that the rise in risky debt could be exposed to rising interest rates, becoming unsustainable and causing future bankruptcies. Much corporate debt issued during the pandemic is due to expire in 2024 and could create an influx of defaults.

Public stimulus can prevent the permanent scarring effects that can result from allowing bankruptcies and subsequent rises in unemployment and stalling business potential. However, navigating out of a private sector webbed together by the state, could be a challenge. Puy and Rawdanowicz suggest converting corporate debt to grants, contingent on firm performance and assessments of firm viability, and encouraging equity financing in the private sector to extract the public sector from private firms.

The UK government reformed insolvency law, including permanent changes (such as opportunities for corporate debt restructuring for viable companies before insolvency and prohibiting supply reductions to companies in financial distress) and temporary measures to prevent business collapse due to pandemic-related financial pressures. Permanent measures should help to prevent a wave of bankruptcies when public assistance to private firms reduces. Temporary measures will wind to a close in the latter half of 2021.

Corporate debt restructuring and insolvency law will be a key factor in the post-pandemic economy to manage debt overhang, zombification, and risky debt build-up, in order to transition to viable post-pandemic growth. The extent of the situation will be revealed when smaller firms, who together employ a large portion of the population, emerge from the pandemic and have reduced government support.

Large firms often have more scope for financial cushioning, whereas small firms are often sensitive to volatile demand markets and swift changes in financing. It has been suggested that following the pandemic, grants and loans for start-ups ought to prioritise companies with long-term growth potential and align with the future economy (such as those that assist the UK to meet climate goals and the increase in digitisation).

3.3. What Have We Learnt about Managing Pandemic Economies?

Long-term growth is heavily contingent on short-term policy reactions to the onset of the pandemic. The most effective strategy for fast economic recovery and to generate

certainty over future growth is virus elimination. 'Stop-go' virus control (attempting economic recovery whilst the virus is still prevalent), 'based on reaction over anticipation' (Philippe Aghion et al.), has proven more economically damaging than creating and maintaining 'COVID green zones' (where cases have been eliminated).

Countries that favoured elimination experienced a faster return to economic growth and improved long-term growth potential. GDP in 'zero COVID' countries returned to 2019 quarter-four levels at the end of 2020 and eclipsed 2019 levels on average in 2021. Economic and health literature has identified that lockdowns must be early when cases first emerge to have the most effective health and economic impacts.

Early and widespread screening, border restrictions, case detection, masks and social distancing help to mitigate long-term health and economic damage. Although stringent lockdowns create sharp reductions in GDP, without lockdowns, the presence of the virus creates economic slowdowns due to uncertainty and public anxiety, reducing business footfall, impacting negatively on growth. Workplace closures have been identified as effective for reducing infection spread but pose the greatest economic cost.

Short-term economic closure can create long-term scarring. Measures to compensate workers, such as furlough schemes, to prevent mass unemployment can reduce scarring effects. Government aid packages to prevent business failures and retain employees are accredited as reducing national unemployment and assisting the economy as it traverses through the height of the crisis.

'Stop–go' countries suffer longer recessionary effects; despite rapid growth in the UK, the economy is not expected to return to pre-pandemic levels until the end of 2021 or quarter-one of 2022 (end of 2021 for the EU). Adopting 'stop–go' strategies prevents firms from planning ahead for the long term, encouraging businesses to hoard cash to cover the next wave of lockdowns and hiring on a temporary basis, instead of investing (physical and human capital) to improve future productivity needed for growth.

Aghion et al. suggest that disparities in growth and recovery between 'stop–go' and elimination strategies may extend into a post-pandemic economy and although vaccination is a vital part of exiting the pandemic, it cannot be the sole focus of elimination strategy and economic recovery. Successively creating 'green-zones' can restore the interconnected economy and free travel that was intrinsic to global economic function pre-pandemic.

Local restrictions can enable COVID-free areas to regain normal economic function and improve local economic recovery. To mitigate dangers of reopening, it has been suggested that social distancing should be maintained during vaccine rollouts to prevent a delayed surge that could cause further restrictions, whilst gatherings and large public events should still be prohibited until significant immunity has been reached, to minimise economic damage.

4. Automation

This section draws on the references [15–17].

4.1. How Does Automation Affect Growth and Restructuring?

Automation increases productivity, which is a key driving force of economic growth. With an increase in automation, it has been identified in historical data that average incomes rise, increasing aggregate standard of living. Automation, however, is not a new phenomenon. We have experienced rapid automation before—during the mechanisation of the Industrial Revolution and in the latter half of the 20th century, the ICT age saw the widespread uptake of computers.

There is large variation in the estimates of how many workers' jobs will be replaced by computers, robots, or AI. Perspectives on the world of robots range from a computer-led transition to mass human unemployment (accompanied by calls for Universal Basic Income) to labour reallocation into new fields of work, complemented by automated processes. James Bessen notes that in historical periods of automation, automating sectors have experienced increased employment.

This is due to the driving force behind the need for increased—and more efficient—production: market demand. Sectors that are in demand are striving to increase output, leading to mechanisation to improve efficiency, but also recruiting more workers. The demand an industry faces will determine the employment effects of automation; as Bessen highlights, 'while automation may eliminate jobs in some industries, it creates jobs in others'.

Automation increases efficiency, hence lowers the costs of production, lowering prices consumers face. The initial decrease in prices increases demand, however demand slows with time, so as price reduces further, there is reducing marginal increases in demand. As demand surges, employment increases, however as demand becomes satiated (consumers do not gain extra satisfaction from consuming more of a given good), employment begins to fall.

If there is unsatisfied demand in a given sector, automation may (given historical standards) increase employment in that sector. In the near future, it is estimated that there will be a reallocative effect, as jobs diminish in some sectors but emerge in others (such as those supplying the automation and computer technologies) due to trends in demand. The main policy difficulty is predicted to be adequate, timely, and appropriate reskilling in order to improve labour flexibility so that workers can shift profession as sectors adjust to automation. If reskilling and opportunities for human capital accumulation are not forthcoming, there will be skills mismatches, leading to unemployment in automated sectors and vacancies in sectors with growing demand.

However, the effects of automation depend on whether workers can be reskilled or not. It has been identified that in many sectors, automation has been labour-replacing instead of labour-complementing. Many low-skilled jobs are replaced by machines as automation increases in manufacturing and supply chains. Further, AI is becoming increasingly efficient and precise in medical diagnoses, 3D printing custom parts and enhancing decision-making processes, whilst computerised processes execute tasks in finance. As a result, many jobs viewed as skilled and requiring higher level qualifications (such as university degrees) are automatable.

A pertinent question is, what is the expected effect of automation on inequalities? Given many routine tasks are easiest to automate, and provide improvements in productivity, it is estimated that wages in low-skilled work may stagnate whilst highly skilled sectors, such as robotics and computer software design, will likely rise as demand increases.

Without upskilling to create flexibility in the labour market, wage inequalities will increase. It has been noted that when robots can replace workers in certain tasks, labour and robots are labour-market competitors—the gain from a robot's output, however, contributes directly to firm profit, whilst human output is compensated with wages (outgoing from the firm). As a result, labour income share decreases.

The issue of automation in re-shoring (when high-income countries re-adopt processes that had previously been outsourced offshore, such as car assembly) has been found to have a negative effect. Areas that lost manufacturing to offshoring in the past do not have their jobs reinstated, instead robots replace them.

4.2. Work-From-Anywhere Jobs

COVID-19 has been viewed as an accelerating force for adopting automation and changing the traditional office-based workplace. Firms have an incentive to replace workers with automation to continue business operations when people cannot work. However, working from home has been viewed as a COVID adaptation that could remain for many.

There are productivity gains associated with working from home, as employees can gain 'temporal flexibility' (choose which hours to work within the day). Over recent years, a new variety of working from home—working from anywhere (WFA)—has emerged. It is argued that WFA further increases employee autonomy in the form of 'geographical flexibility' as they can also choose where to live to complete their work. In a study of the productivity gains from WFA models, Prithwiraj Choudhury, Cirrus Foroughi, and Barbara Larson identified that 'WFA policy can provide direct economic value to both employees

and firms'. They found measurable productivity increases in workers who moved from working from home to WFA models and suggested that a progression to widespread WFA would likely be facilitated via a transition to working from home. Working from home and WFA models are viewed as 'non pecuniary incentives', meaning they derive non-cash/non-economic benefits for the worker (they affect the worker's lifestyle and perception of quality of life).

WFA reduces spatial mismatches (a cause of persistent inequalities identified in our third paper), increasing employment and productivity. Jobs can enable specific skillsets to work in the roles where they are best suited, improving efficiency and, hence, growth potential. Choudhury et al. highlight: 'Human capital has been documented as a critical source of firm competitive advantage', hence there is a 'firm-specific incentive to attract and retain skilled employees'.

As noted in our third paper, work-related stress and loss of well-being is on the rise. Lack of autonomy at work and pressure from within the workplace are identified as major contributors of work-related stress and anxiety. Enabling greater flexibility in how to conduct work and enabling the worker greater choice in where they work could allow employees to design their work environment to best suit their well-being. Working from home is evidenced to reduce sick days and breaks, increasing productivity. WFA extends these benefits to the possibility of moving to an area with a lower cost of living (increasing real income) or an area the employee likes to live (due to the climate, scenery, or available activities).

4.3. How Can We Benefit from Automation and WFA?

David Bloom and Klaus Prettner suggest that investment in education will mitigate the negative employment effects of automation, particularly if educational opportunities are available to low-income households and individuals.

This strategy will act to reduce multi-generational compounding income inequalities. Retraining unemployed workers, and investing in skills at school level that are specific to changing industry, will be vital—in particular, they note 'to focus more on skills that are complementary to automation technologies and less on memorising facts'. They also indicate that as unemployment rises as a result of automation, adjustments to social welfare may be required to accommodate the changing shape of the labour market.

It will also be necessary to promote sustainable sources of energy for increasingly mechanised workplaces/industries so as to promote environmentally sustainable growth. To maximise the benefits of WFA models, it is necessary to widen access to remote working technologies and make opportunities available for skilling in whichever sector people have talents and motivation (people no longer need to be limited to local work opportunities). Equal access to high-speed internet would also needs to be a priority.

Choudhury et al. stress that further study is needed to identify how WFA models benefit working environments that have greater interdependence in the workplace and to study managerial decision-making with remote employees. There are also social costs of isolation and business costs of coordinating work and employees—these areas require further investigation.

5. Future Growth

This Section draws on the references [18–24].

5.1. What Next for 21st Century Industrialisation?

Economies that have not experienced sustained economic growth through industrialisation have been left behind and experience the worst life expectancies, health outcomes, educational opportunities, and standards of living in the modern world. Nations that have not yet industrialised will be most adversely affected by climate change—intensifying weather patterns could threaten agricultural methods and at worst, make land unproductive, or inhabitable.

Developing economies will also be last to recover from COVID-19. All economies need to grow, and citizens need access to growth, to mitigate against adverse climate effects and increase national wealth to improve standards of living. Global growth improves international prospects, generates individual financial autonomy and reduces costs of inequality that impact economic flexibility and productivity.

How do we create growth in developing economies? Replicating fossil-fuel centric industrialisation in developing economies would accelerate the onset of climate change effects. This is problematic. Growth can enable adaptability but the wrong kind of growth can exacerbate existing problems. As such, for developing economies, nations must seek a sustainable path to growth.

Enacting growth in developing economies has many of the same principles as alleviating inequalities, building climate resilience and sustaining post-pandemic growth in developed economies. Inequalities, climate events and structural changes are expensive, posing societal and economic costs. Facing intensified weather cycles will be more expensive if there is a large amount of ill-health in the population.

Coordinating an economy in a crisis will be more difficult if human capital is wasted through inequitable skilling of the population. Devising new technologies will be time-consuming if the most talented individuals have not been able to access opportunities to maximise their potential. In the meantime, productivity and national income can increase if employment is improved and widened, whilst the economic costs of maintaining inequalities will reduce.

5.2. Inclusive Growth

The UK experiences significant economic inequalities, creating direct and opportunity costs. These regional inequalities manifest on a global scale. A 2016 Joseph Rowntree Foundation report indicated that governments would be advised to embark on a 'social deal' of inclusive growth, which favours reconnecting poorer areas into the wider national economy to enable them to benefit from economic growth.

Inclusive growth can be viewed as a more holistic multidimensional view to growth, including policies on transport, employment distribution, urban planning, housing, skills-training and healthcare (many of the same roots as strategies to alleviate health inequalities). Lee and Sissons note: 'In the UK, around half of all people leaving poverty do so because their earnings increase rather than because they enter employment'.

Poverty levels affect growth and low growth perpetuates poverty. By lifting areas out of poverty through higher-paid skilled work, nations can create self-sustaining local economies to prevent recurrence of deprivation when government intervention is reduced. Enabling equitable opportunity, through education, skills-training and accessible networks can enable greater long-run growth, by alleviating persistent poverty.

Policy cohesion is a key aspect of more equitable distribution of growth, successfully assimilating local strategy with a national investment plan. Local factors are determinants of successfully reducing deprivation through access to growth—misidentifying an area's need perpetuates poor employment outcomes. These factors can inform economic policy to tailor devolved power and spending.

Regions are heterogeneous so contribute to different aspects of the economy, posing different challenges to budgets. Therefore, substituting one-size-fits-all economic policies with area-specific strategies could prevent further long-term economic damage. Levelling regional economies reduces fluctuations in local economies as a result of national economic trends.

The Marmot report commented that 'the most powerful outcomes that result from interventions at each stage in the life course are to be found later in life'. Thus, this indicates that measures implemented to improve the economic divide and its effect on health and standard of living would not have instant benefits but would reap dividends over the long-term. Although it is difficult to suggest large-scale reforms during periods of economic

turbulence, to combat myopia, regeneration policy must be free-standing to outlive a given government.

5.3. Sustainable Growth

As industrialisation has spread, the strain on natural resources to facilitate growing demand has increased, tying economic growth to environmental degradation, as there are limits to the natural capacity of ecosystems and natural resources. Socio-economic and environmental problems have arisen from the manner in which we have pursued growth and the allocation of growth's benefits. This need not always be the case.

Achieving climate goals will require shifts from traditional growth policy to prevent damage in the future. It is predicted that there will be smaller impacts on GDP up to 2050–2060 from climate effects, however, if the current growth course continues, the damage inflicted as we reach 2060 would be irreversible. As climate change progresses, inequalities and pre-existing socio-economic difficulties will intensify—we will be trying to fight too many fires simultaneously.

There are two aspects to how we approach climate change: the economic and societal adaptations to decelerate global warming, loss of biodiversity and destruction of ecosystems, and mitigating the effects of climate change events when they arise. Growth need not be limited to the quantity of resources or potential be restricted by reducing emissions. Adaptations to production and consumption entail improving the efficiency of distribution and usage of scarce resources, substituting environmentally damaging inputs for new methods through innovations in technology and reducing consumption.

There does not appear conclusive empirical evidence that natural capital is both the determining factor and the limiter of economic growth (all regions with profitable natural capital have not experienced equivalent growth). Enabling growth is contingent on the quality of institutions, innovations in productivity and other macroeconomic conditions, such as trade. There is little evidence to suggest that environmental regulation reduces market competitiveness. It has further been suggested that any loss in competitiveness can be offset by reductions in taxes for conforming industries, reducing overall costs of adaptation to regulations.

Alleviating inequalities is a priority for improving economic resilience. Improving economic shock absorption enables the economy to withstand recurrent climatic events. Improving health equity reduces the health impacts of climate change, whilst education improves decision-making and equips the population with information to take actions that have greater societal benefits, and businesses to adopt more sustainable strategies. Improving human capital to enable better paid employment provides greater adaptability at a household level.

Those in poorer areas of developed economies are more likely to live in urban areas where air pollution and extreme heat will be more prevalent, and work in sectors of employment that could become unproductive and obsolete in the event of climate change altering the shape of industry. Microfinance, usually implemented in developing economies to widen access to the domestic market-economy, could be implemented in developed economies to break the self-enforcing poverty-low growth cycle, encouraging investment to improve household wealth and enable greater access to economic growth.

Being part of a sustainable national economy could enable groups to adapt with the changing tides of the national macroeconomic picture, instead of becoming increasingly disconnected. However, government intervention has been identified as a necessary step to ensure businesses and individuals invest and plan in the sectors necessary for climate resilience.

5.4. A Call for New Metrics

GDP has come under fire in recent decades as a sole metric of the vitality of an economy, with some economists and political figures reasoning that it does not provide a complete picture of an economy's well-being. GDP has primarily been criticised for three reasons:

excluded nonmarket goods (such as unpaid domestic work, the value of leisure, used goods and transfer payments), sustainability (encompassing production, whether or not it contributes to pollution or poor health) and representation of well-being and inequality.

Recent research suggests emissions-adjusted GDP as a more representative metric, which views the impacts of pollution as, 'an unpriced cost associated with production and consumption of market goods and services' (Aniruddh Mohan, Akshay Thyagarajan, and Nicholas Muller). Traditional growth accounting is expanded to 'deduct environmental pollution damage from the national income and product accounts' to quantify environmental damage in monetary terms.

In the late 20th century, some economists argued that the sole metric of GDP does not enable developing economies to demonstrate progress when measured alongside strong industrialised nations. Calls for more representative measures of socio-economic development generated the Human Development Index (HDI) in 1990, designed to incorporate life expectancy and educational attainment with average income per capita.

Measuring happiness as a metric of an economy's well-being has gained attention. Considering happiness as a measure of prosperity is not a new idea—the origins of 'utility' in the Enlightenment Era balanced pleasure and pain to gauge the happiness an individual derives from undertaking an action. Utility morphed into the most efficient usage of limited monetary budgets, as, like GDP, monetary metrics are simple to quantify and compare, as opposed to happiness which is subjective. However, happiness studies saw a resurgence with national opinion polls in the 1950s and 1960s.

With the modern rise in behavioural economics, psychological reactions to economic interactions are increasingly incorporated into economic studies. Research on the influence of monetary wealth on happiness has continued to develop with mixed results on increasing happiness as a direct result of wealth. However, it has been suggested that it is opportunities wealth brings that can increase subjective well-being, not money itself.

As a result, a 'dashboard' of indicators has gained ground as an alternative to one-metric measures of society, increasing the indicators of economic prosperity to include measures of health, education, employment and opportunities. Diane Coyle asserted in 2014: 'There are good arguments for paying less attention to GDP and more to indicators of welfare and sustainability, but it would be a mistake to adjust or replace GDP'. GDP as a measure of economic output is powerful and dominant. To measure other aspects of an economy, we require more measuring sticks, not merely one new prevailing metric. The future will be a time for increasing measurement, to articulate the challenges we face and to design policy to confront them.

6. Conclusions

In this paper, we reflected on some of the challenges that will affect future growth and development in the UK and abroad, and surveyed suggestions from literature as to how these challenges may be addressed.

Firstly, we discussed climate change and recovery from the COVID-19 pandemic. The former will force us to rethink our economy, whilst the latter may provide apt lessons for future crises. With a focus on comparisons of employment structure as a key determinant of growth prospects and inequalities, we looked at automation within a global perspective, as national economies do not exist in isolation. We viewed how adopting growth in developing economies can improve standards of living and economic versatility, and considered how catch-up growth can be aligned to the joint aims of climate readiness and accessibility to reduce inequality. Finally, we considered the form economic growth may take in the future, and how growth can enable a more equitable and resilient global economy, given that sustained economic growth can provide us with the wealth to make economies more sustainable, environmentally friendly, digital, and accessible.

Monitoring and encouraging economic growth is unlikely to fade into obscurity any time soon. Although it may be accompanied by a greater range of metrics to measure 'progress', growth will likely gain increasing significance as we confront future challenges.

As Max Roser aptly affirms, 'economic growth does not matter for its own sake, but because rising prosperity is a means for many ends. It is because a person has more choices as their prosperity grows that economists care so much about growth'.

Britain's early relationship with economic growth sculpted global societies as the spread of industrialisation has determined way of life, constituting the modern sense of self, heritage and the lived experience. During the era of growth, humankind has progressed from handwoven cloth to speaking computers, whilst the dominance of growth has forged new political systems and economic ideas. Without economic growth, who would we be? And most pertinently, where will growth take us next?

Exploring the paths of the UK and global economies in recent months constitutes an intriguing direction for future research into international growth and the interdependence of modern economies. One may start by investigating events that have occurred following completion of this paper, such as the upward pressure on cost of living, supply-side shocks, post-pandemic management (along with more conclusions that have arisen regarding pandemic management) and the political economy (such as the war in the Ukraine). Through these investigations one could extend perspectives on potential directions of growth, and contemplate policy-decisions that can foster readiness for future challenges.

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