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From Knowledge Economy to Automation Anxiety: A Growth Regime in Crisis?

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ABSTRACT

In the 1990s, the 'knowledge economy' was hailed as a key driver of future prosperity by progressive policymakers in developed democracies. According to its proponents, in the knowledge economy, companies and countries alike would succeed by cultivating workers' knowledge – as opposed to traditional forms of capital such as plant and machinery. This had radical implications for public policy, implying that education reform and other supply-side interventions could deliver inclusivity as well as prosperity. Today, however, this benevolent vision of the social and economic impacts of technological progress has been superseded by an altogether more dystopian view, associated with automation and the rise of artificial intelligence, as well as transformations in the digital economy and the evolving nature of globalisation. This paper analyses that transition. It charts the key assumptions of the knowledge economy concept, through an intellectual history that focuses on how these ideas manifested themselves in the rhetoric of the UK Government under Tony Blair. It then shows how evolving understandings of the digital economy, technological progress and globalisation challenge these assumptions, and the policy agenda that was premised on them.

KEYWORDS

Knowledge economy; New Labour; automation; globalisation; growth regimes

Introduction

In the 1990s, the 'knowledge economy' was hailed as a key driver of future prosperity by progressive policymakers in developed democracies. According to its proponents, in the knowledge economy, companies and countries alike would succeed by cultivating workers' knowledge – as opposed to traditional forms of capital such as plant and machinery. Growth in cognitively demanding, well-paid work was in principle unbounded, and could compensate for the loss of skilled blue-collar jobs that had taken place during the preceding era of market liberalisation and globalisation (Reich 1991, Giddens 1998, 2000).

Fast-forward twenty years, and this benevolent vision of the knowledge economy has been superseded by an altogether more dystopian view of technological progress, associated with automation and the rise of artificial intelligence. Whereas the knowledge economy had a distinctly egalitarian character – insofar as anyone with education could access its opportunities – the new digital economy is one in which the ownership of machines (and the data that underpins them) matters. Many existing high-skill knowledge-based jobs are supposedly at risk, rendered obsolete by new technological advances. Furthermore, ongoing globalisation creates competition as well as opportunities for knowledge workers in developed democracies, as emerging economies such as China and India seek to capture a greater share of knowledge-based growth.

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In these changed circumstances, the public policy prescriptions associated with the knowledge economy no longer appear capable of delivering the outcomes that their proponents once envisaged. Yet the agenda of knowledge-based growth remains with us. The European Commission's 'Europe 2020' strategy 'for smart, sustainable and inclusive growth' emphasised investment in R&D, coupled with better education and wider access to high-speed internet (European Commission 2010). The OECD's (2015) report on 'The Future of Productivity' argued that economic stagnation can be tackled by investing in research, removing labour market rigidities, easing regulation of services, increasing cross-border trade, and improving the international mobility of skilled workers. Prominent political figures still claim that 'universal, affordable broadband … would do more than anything else to help growth to return to areas that have been left out and left behind' (Clinton 2015). Although the UK government's recent white paper on industrial strategy included new policies such as an 'Industrial Strategy Challenge Fund' alongside more familiar proposals around training, skills, and infrastructure (HM Government 2017), the amount of public investment contemplated is comparatively low, with the emphasis on crowding-in private sector involvement rather than a more active role for the state (Berry 2016). While some commentators today give greater weight to a broader range of policy tools, including demand-side interventions (Mazzucato 2015, Summers 2015), for many the emphasis on supply-side reform remains.

This paper examines how the realities of knowledge-based growth in advanced democracies diverged from the vision of the knowledge economy that gained currency in the 1990s and early 2000s. The following section outlines how this investigation fits into existing debates in public policy and political economy, and the methodological approach adopted. The paper then surveys the concept of the 'knowledge economy', looking both at its provenance, and how it was understood in its heyday of the 1990s and early 2000s. We examine what this knowledge economy concept implied for public policy, before sketching how the changing character of the digital economy, technological progress and globalisation have called into question the assumptions on which this policy agenda was premised.

Background and Methodology

This paper treats the idea of the knowledge economy, and the public policy programme built around it, as a 'growth regime' – that is to say, as a set of policies and practices that core economic actors in a given society deploy in order to deliver economic growth, and the understanding of the economy that underpins this agenda. Clearly, such growth regimes may differ significantly between countries, and over time. Nevertheless, there are important similarities between these regimes as well. Hall (2015) suggests that the economic policies pursued by developed democracies in the post-war period can be usefully divided into three distinct eras: the era of the mixed economy from the 1950s to the mid-1970s, the era of market liberalisation in the 1980s and early 1990s, and the era of knowledge-based growth leading up to the present. Transitions between these growth regimes involve 'obvious failures of policy', which 'set in motion a search for alternatives'; Hall offers the example of 1970s stagflation as motivating a move from post-war Keynesianism to the pro-market policies of the 1980s. Significantly, growth regimes are not simply technocratic strategies, reflecting developments in the state of the art of economics.[1] They are also in some sense social contracts – agreements governing the reciprocal expectations of governments, firms, and citizens.

On this view, the knowledge economy can be understood as a response to the social and economic dislocations arising from the era of market liberalisation, which saw many developed democracies grappling with high levels of long-term and youth unemployment (Hutton 1996, Hall 2015). Politically speaking, knowledge-based growth seemed to offer progressives such as Bill Clinton, Tony Blair and Gerhard Schröder a way of appealing both to an educated middle class attracted to the economic and cultural promises of liberal internationalism, as well as to groups who had hitherto been 'left behind' by globalisation. It enabled them to embrace the dynamism and

efficiency of markets, while simultaneously critiquing the consequences of unbound neoliberalism, leading to the synthesis of 'Third Way' politics (Giddens 1998).

Building on Hall's analysis, this paper suggests that the knowledge-based growth regime that emerged during the 1990s and early 2000s may be undergoing a transformative crisis, comparable to those that beset its predecessors. To this end, the bulk of this paper is devoted to reconstructing both the idea of the knowledge economy prevalent during this period, as well as its public policy implications. This analysis is predominantly an exercise in intellectual history, drawing on a range of publications and speeches by politicians, government departments, international institutions, as well as influential commentators in the wider public sphere. Because a comprehensive international survey of these ideas would be beyond the scope of a single article, we have focused primarily on the rhetoric and policy agenda of the UK government under Tony Blair, with a particular emphasis on the former Prime Minister and his inner circle. The UK case is in many ways archetypal of knowledge economy thinking more broadly: while political leaders such as Clinton and Schröder made reference to the concept of the knowledge economy, none invoked it as systematically or over such a long period as Blair and the New Labour government that he led. And while certain aspects of the knowledge economy debate within the UK were atypical of other countries – such as the importance attributed to knowledge-work in the financial sector – many resonated elsewhere. Consequently, the UK case enables us to see how the logic of knowledge-based growth can influence thinking across a range of different policy domains.

What are the advantages of such an approach? By focusing on the explanations and rationalisations actually deployed by politicians, public officials, thinktanks, and the like, our analysis starts from the language of policy itself, directly addressing the assumptions and concerns of the policy-making community. This language is also the language in which policies were justified to the wider public; hence analysing the subsequent fate of these ideas may help us to explain the political fortunes of the politicians and parties most closely associated with them. Moreover, to the extent that the agenda of supply-side reform to promote knowledge-based growth remains with us, it is worthwhile querying the assumptions that originally accompanied it, to assess whether they are still plausible today.

With that in mind, the penultimate section of the paper offers a high-level overview of key developments in the understanding of knowledge-based growth over the last two decades, indicating how these qualify and challenge earlier ideas about the knowledge economy. The point of this section is not to make the trivial point that the reality of knowledge-based growth fell short of politicians' promises. Problems of *politics* beset all such pledges: the benefits of a particular policy programme may be overstated in order to secure support, or because of the self-serving self-deception of its proponents; once in office, the advocates of a programme may prove unwilling or unable to implement it (or implement it fully). The goal of this paper is to demonstrate how the agenda of knowledge-based growth suffered from more fundamental problems of *policy*: that is to say, flaws in the understanding of the economy on which it was premised. Given what we know now about the nature and character of knowledge-based growth, this article contests that the public policy agenda of the knowledge economy was always destined to disappoint.

This matters both for analysis and for policy. In the wake of the financial crisis, commentators have downplayed the significance of the knowledge economy. In the UK, for example, the putatively knowledge-driven growth of the 'Great Moderation' looks with hindsight like a long spell of irrational exuberance, a house-price bubble driven by an unsustainable expansion of household and financial sector debt (Hay 2011) – an approach to growth sometimes characterised as 'privatised Keynesianism' (Crouch 2009). On this analysis, the subsequent policy response reads as an attempt to resurrect financial sector growth and asset price inflation, through measures such as corporate tax cuts for business and quantitative easing (Hay 2013, Green and Lavery 2015). There is a great deal of merit in this kind of analysis: revealing what policy elites are actually doing (wittingly or otherwise) rather than what they claim to be doing. But by downplaying the role of the knowledge economy

in what has gone before, such an approach risks implying that knowledge-based growth offers an *alternative* to the policy agenda of recent years.

By contrast, our account suggests that the knowledge-based growth regime existed in parallel with the privatised Keynesianism of the Anglo-liberal growth model, as well as with other 'growth models' exhibiting different characteristics – for instance, export-led growth, or domestic consumption premised on robust wage growth (Baccaro and Pontusson 2016, Hope and Soskice 2016). Whereas the financial crisis often plays a pivotal role in such accounts – by revealing the fragility of growth dependent variously on the expansion of the financial sector (Haldane *et al*. 2010, Thompson 2013), on the expansion of domestic demand, or on the expansion of exports to demand-led economies (Iversen *et al*. 2016) – knowledge-based growth focuses our attention on the broader economic trends that predated the crisis. These include the decoupling of average living standards from aggregate-level growth, and the slowdown in aggregate-level growth itself (Gordon 2012, Pessoa and Van Reenen 2012, Bivens and Mishel 2015, Summers 2016). The analysis advanced in this paper suggests that, while the financial crisis and its aftermath have undoubtedly posed major challenges to governments in their pursuit of knowledge-based growth, the problems confronting the knowledge economy agenda are to a certain extent independent of these events. Even without the crisis, the knowledge-based growth regime would have come under pressure from the evolving nature of knowledge-based growth itself, in particular the emergent properties of the digital economy, technological progress, and globalisation.

The Knowledge Economy

What is (or was) the 'knowledge economy'? The phrase itself originated in the 1960s and early 1970s, when management theorists and sociologists sought to contrast 'manual workers' who engage in physical labour to produce conventional goods and services with 'knowledge workers' who engage in intellectual labour to produce ideas and information (Drucker 1967, Bell 1974). According to these commentators, technologically advanced economies were experiencing a shift from manual work to knowledge work, which would drive future growth and prosperity for individuals, firms and countries alike. The knowledge economy was the endpoint of this upheaval, a state of affairs in which knowledge work would become the dominant productive force in society.

The concept was not widely adopted during the 1970s and 1980s (see Figure 1). One reason for this may have been that, relative to the broader shift from manufacturing to services over these two

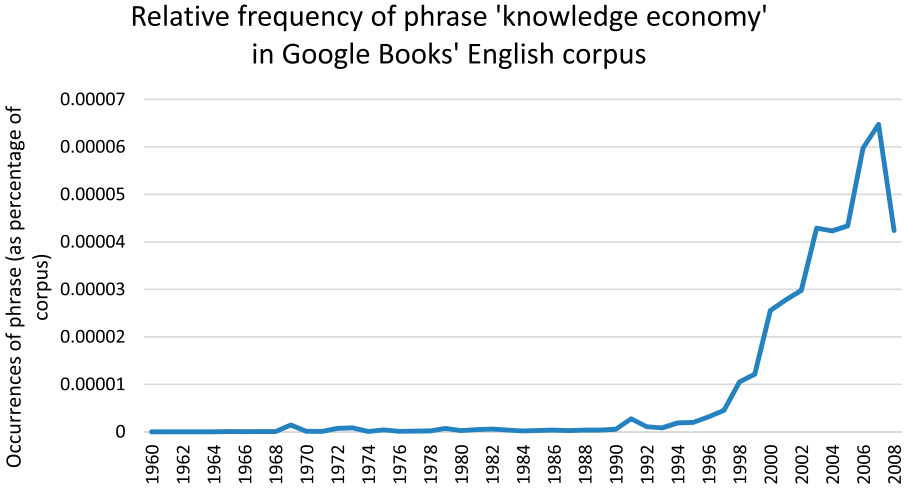

Figure 1. NGram showing relative frequency of the phrase 'knowledge economy' (Michel *et al*. 2011).

decades, the trends associated with the knowledge economy were small in size and significance. Many of the new service sector jobs that emerged during this period were not particularly knowledge-intensive, and productivity growth in service industries was not particularly impressive (Loveman 1994). This was the period that gave rise to Robert Solow's oft-repeated observation that 'you can see the computer age everywhere but in the productivity statistics' (1987). Post-industrialisation and the rise of the service economy arguably served as more equivocal – and thus more appropriate – descriptors of socioeconomic change during this period than the optimistic futurism of the 'knowledge economy'.

The idea of the knowledge economy found new resonance in the 1990s, with the rise of home and office computing, and the advent of the World Wide Web. The expansion in computer ownership, and the exponential growth of IT-sector businesses such as Dell, Yahoo! and Microsoft, seemed to herald a paradigm shift in the wider economy. New 'weightless' business models – whereby a company's assets were conceived primarily in terms of personnel and institutional knowledge, rather than plant and machinery – emerged in sectors ranging from marketing through to finance, demonstrating the increasing significance of knowledge workers to the economy (Quah 1997, Coyle 1999). The success of knowledge-intensive firms and knowledge-intensive industries – including computing, biotechnology, advanced manufacturing, media, telecommunications and more – played a significant role in the revival of productivity growth in the UK and the US (Baily and Lawrence 2001). The inflation of the dot-com bubble doubtless also burnished the credentials of the knowledge economy (Howcroft 2001), though as Figure 1 indicates, its subsequent collapse by no means heralded the concept's demise.

This economic revolution attracted the interest of management theorists, economists and policymakers alike. Students of management examined how companies could take advantage of knowledge-driven growth (Drucker 1994). Economists debated whether the knowledge economy might require changes in the fundamental axioms of economic theory, such as the law of diminishing returns (Arthur 1996). However, it was the interest of politicians that brought discussion of the knowledge economy out of academia and consultancy, and into the heart of public debate. Throughout the 1990s and into the first decade of the new millennium, the knowledge economy attracted the attention of thinktanks, public intellectuals and policymakers, who sought to understand how countries might best position themselves in this new economic paradigm (see e.g. Reich 1991, Mandelson and Liddle 1996, Clinton 1997, DTI 1998, Blair and Schröder 1999, Stiglitz 1999, Blair 1999a, Giddens 2000).

What, then, were the key features of the knowledge economy, as it was understood in its 1990s heyday? First and foremost, the term 'knowledge economy' indicates that knowledge workers, who produce ideas and new technologies, are in the ascendant. This means that they constitute the dominant force in the economy – if not necessarily numerically or even in terms of total gross value creation, then at least in terms of productivity growth. In the knowledge economy, knowledge-intensive industries such as advanced manufacturing, biochemical engineering, and information technology become essential to prosperity (Stevens 1996, Powell and Snellman 2004).

A corollary of the increased importance of knowledge workers is that businesses that rely on traditional as opposed to human capital (such as large-scale manufacturing) contribute less to growth in relative terms than more knowledge-intensive businesses. The same is also true of businesses reliant on unskilled labour (for example, low-wage service industries such as cleaning and caring). 'Productivity in the advanced economies, unlike in earlier stages of capitalist development, is no longer so dependent upon the adding of capital or labour to the production process' (Giddens 2000). This has implications for the bargaining power of knowledge workers vis-à-vis other members of the workforce, and can thus exacerbate inequality (Autor *et al*. 1998, Berman *et al*. 1998). However, it also has implications for the bargaining power of knowledge workers vis-à-vis their employers, which can mitigate the social divisions associated with the unequal distribution of wealth. In knowledge-intensive businesses, the marginal product of labour will be substantially greater than the marginal product of capital, with implications for the return to shareholders and

other owners of wealth: when economies are dynamic, when innovation levels are high and productivity growth is rapid, capital takes a smaller share of national income than at other times (Piketty 2014).

Indeed, in the knowledge economy, owning assets can be actively disadvantageous. Investment in physical assets can reduce the agility of businesses, committing them to particular production processes until investment costs are recouped. Agility is all-important, because the knowledge economy is highly dynamic: there is a high level of business creation, and a concomitantly high level of business failure (Audretsch and Thurik 2000). Entrepreneurs are constantly innovating to identify new markets, new products, new ideas, and they must continue to do so because the knowledge economy is highly competitive – not least because barriers to entry in knowledge-intensive industries are extremely low, once would-be competitors possess the necessary know-how. 'Information and communications technologies … and shortening product cycles make it increasingly easy for new entrants to compete head to head with established players' (DTI 1998).

While manual labour, and the goods and services it produces, are not eliminated in the knowledge economy, their importance diminishes. Knowledge work can make manual processes more efficient, with the introduction of better management techniques, or with the automation of some manual tasks. Assuming a reasonably strong international intellectual property regime, if a country specialises in the production of knowledge (for instance, the design for a new microchip), the physical embodiment of that knowledge (the microchip itself) can be manufactured elsewhere (Rosecrance 1996). The knowledge-intensive economy dominates the highest echelons of global value chains, guaranteeing for its workers and for the society in which they operate a substantial share of global growth, both in terms of output and in terms of high-skill, high-pay knowledge-based jobs.

Public Policy in the Knowledge Economy

Given this understanding of the knowledge economy, how did policymakers seek to equip their countries to capitalise on its opportunities, and to avoid (or at least mitigate) its downsides? In this section, we will examine how the knowledge economy informed the rhetoric and policy of the UK government under Tony Blair. The enthusiasm for knowledge-based growth expressed by key figures in Blair's government, coupled with that government's comparative longevity, make this a valuable case study for investigating how policymakers understood and responded to the rise of the knowledge economy.

Education

First and foremost, in order to make the transition to the knowledge economy, and thereby reap the rewards of growth in knowledge-intensive industries, countries need knowledge workers. Policymakers must therefore ensure that the education system provides a sustainable supply of appropriately-skilled individuals into the labour market. For progressives at least, this implied increased public investment in education, coupled with reforms to ensure that public spending delivered the educational outcomes required by the knowledge economy. In the UK, while in Opposition, Tony Blair had already set out the three main priorities of his government as 'education, education, and education' (1996). While not invoking the 'knowledge economy' concept explicitly, the logic of knowledge-based growth was clearly uppermost in his mind:

> There is only one lasting route to higher living standards, better wages, more secure jobs in today's world. We will win by our brains and our skills or not at all.

A policy agenda in which investment in skills and innovation ultimately adds up to more than the sum of its parts has clear parallels with the new economic growth theory of the 1980s and 1990s. Indeed, in terms of chronology, the new growth theory prompted work by the OECD, which was in turn influential in the 1990s revival of the 'knowledge economy' concept (Godin 2006). According

to these new theories of growth, innovation is endogenous – that is to say, it is not something unexplained and external to the economy, but rather something dependent on investment decisions within the economy, particularly investments in human capital and R&D (Romer 1986, 1990). Investing in human capital thus becomes economically imperative as, over the long-run, innovation is the main source of productivity growth, which in turn drives improvements in prosperity and living standards. The championing of 'post-neoclassical endogenous growth theory' by key figures in New Labour, such as Gordon Brown and his chief adviser Ed Balls, was indicative of this shift towards knowledge-based growth (Brown 1994, Crafts 1996).

For progressives, however, the point of educational investment was not simply to improve aggregate-level economic growth; it was also intended to address problems of social exclusion and inequality. According to a 2006 report prepared on behalf of the UK Treasury:

> where skills were once *a* key driver of prosperity and fairness, they are now *the* key driver. Achieving world class skills is *the* key to achieving economic success and social justice in the new global economy. (Leitch 2006, emphasis in original)

While there was a possibility that growth in knowledge-based work could exacerbate social exclusion and inequality – through increasing the rewards to well-educated individuals, relative to their lower-skilled counterparts – advocates of the knowledge economy believed that education policy could mitigate this risk. Educational improvements would equip more and more people to participate in knowledge-intensive work, which would encourage innovative businesses to invest, which would lead to an ever-increasing number of knowledge-intensive jobs, with more and more people enjoying the higher incomes associated with those jobs. True, progressive proponents of the knowledge economy equivocated as to whether this shift to knowledge work would result in improved equality of outcome, and indeed whether this would be desirable (Blair 1999b). Nevertheless, they believed that investing in education would improve the lot of poorer working households (many of whom had seen their job prospects and living standards eroded by the loss of traditional manufacturing jobs during the 1980s) in absolute terms at the very least:

> When the Tories talk about the spirit of enterprise they mean a few self-made millionaires … But there should be a spirit of enterprise and achievement on the shop floor, in the office as well: in the 16 year-old who starts as an office girl with the realistic chance of ending up as the office manager; in the young graduate with the confidence to take initiatives; in the secretary who takes time out to learn a new language and comes back to search for a new and better job. (Blair 1996)

Significantly, such investments in education would increasingly render other forms of welfare provision unnecessary. To quote Anthony Giddens, the sociologist often referred to as Blair's 'guru' in commentaries of this period, 'the guideline is investment in human capital … rather than the direct provision of economic maintenance' (Giddens 1998). Admittedly, in the UK case, such commitments may have been more rhetorical than substantive (Smith 2014), as social protection expenditure remained relatively stable as a proportion of GDP between 1997 and 2007. Nevertheless, the GDP share of public spending on education did rise by around 20 per cent over the same period (see Figure 2).

Competitive Dynamism

Education was not the sole means by which policymakers hoped to foster knowledge-based growth. As mentioned previously, the knowledge economy requires a high rate of business creation and business failure, as entrepreneurs experiment with new products, processes and business models. To thrive in this environment, businesses must be able to upscale, restructure and downsize rapidly. Traditional labour market regulations – including rules around hiring and firing staff, collective wage bargaining and union representation – stand in the way of this dynamism:

> The rapid advance of the information age, especially the huge potential of electronic commerce, promises to change radically the way we shop, the way we learn, the way we communicate and the way we relax. Rigidity

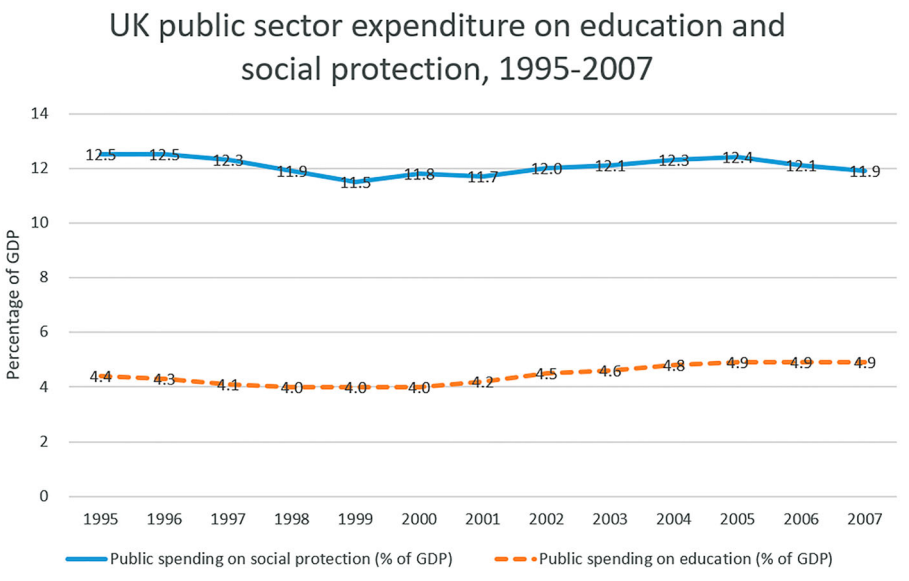

Figure 2. UK public sector expenditure on education and social protection, 1995–2007 (Office for National Statistics).

> and overregulation hamper our success in the knowledge-based service economy of the future. They will hold back the potential of innovation to generate new growth and more jobs. We need to become more flexible, not less. (Blair and Schröder 1999)

Increased labour market flexibility risks increasing the amount of insecure work in the economy as a whole, thereby leading to worse outcomes for workers. However, the knowledge economy's advocates were explicit that the benefits of the knowledge economy should outweigh the disadvantages for the overwhelming majority. Although 'having the same job for life is a thing of the past', workers are compensated for this loss of security by new opportunities: 'the chance to find new jobs, learn new skills, pursue new careers, set up and expand new businesses – in summary, to realise their hopes of a better future' (Blair and Schröder 1999).

How did advocates of the knowledge economy reconcile progressive aims with increased labour market flexibility? The answer lies, again, in the interaction between education policy and the mechanics of the knowledge economy. In knowledge-based businesses, owners and managers are under pressure to keep their workers happy, in order to retain their services. If they fail to do so, then these high-skilled knowledge workers will leave – either to join competitors or to start rival firms on their own account. Because start-up costs in the knowledge economy are extremely low, there should be a plethora of exit options available to high-skilled knowledge workers. Under these conditions, it should be possible to deregulate labour markets without workers finding themselves substantially disadvantaged. To quote Tony Blair, 'the challenge today is to make the employee powerful, not in conflict with the employer but in terms of their marketability in the modern workforce' (2007): marketability compensates for rights as a source of worker empowerment.

Policies intended to facilitate entrepreneurial activity were combined with measures intended to incentivise entrepreneurship. Improving the financial reward for success was seen as an integral part of cultivating the competitive dynamism supposed typical of thriving knowledge economies. Lower tax rates and targeted tax breaks seemed an obvious way to achieve this:

> Many factors contribute to an entrepreneurial culture and some will take time to turn around or are difficult for the Government to influence. One powerful lever that the Government does have is its fiscal policy which can increase the rewards of success. (DTI 1998)

Over the course of its time in office, New Labour introduced a number of reforms to the tax system to reward entrepreneurial activity, including reliefs that meant that affluent entrepreneurs could pay as little as 10 per cent tax on capital gains on business assets (Browne and Phillips 2010).

True, increasing incentives for success meant increasing the potential for inequality, particularly inequality between the richest and the rest. Historically, progressives of various stripes have been concerned about the impact economic inequality can have on wider society and social relations. However, the knowledge economy concept suggested that the concentration of wealth was less concerning, as the significance of capital to an individual's opportunities and relative economic power was supposed to diminish substantially under a knowledge-based growth regime:

> the opportunities and benefits the new economy offers must not be the sole domain of elite knowledge workers. Learning is the key to individuals succeeding in the new economy … The key capability for people to survive and thrive in the new economy is their capacity to learn, and then to apply that learning. (Blair 2000)

Redistribution is not necessary because wealth is not decisive for individual opportunity. When coupled with access to digital infrastructure – 'to beat the divide between those people and regions with and those without internet access' (Mandelson 2002) – education should suffice to enable people based anywhere to participate in the dematerialised, weightless jobs that the knowledge economy provides.

Domestic supply-side reforms were not the only means by which the intensity of entrepreneurial activity and innovation might be increased. Openness to international markets was a further way in which policymakers believed they could harness the benefits of the knowledge economy:

> In the era of rapid globalisation, there is no mystery about what works: an open, liberal economy, prepared constantly to change to remain competitive. The new world rewards those who are open to it. Foreign investment improves our economy. Or take immigration … People who come to work and make their lives here make Britain not weaker but stronger. (Blair 2005)

Immigrant knowledge workers bring with them new ideas and insights, benefiting domestic firms. Overseas investors bring new technologies and expertise into an economy, alongside additional capital. Overseas markets offer new opportunities for knowledge-producing businesses to grow, meaning the potential for workers in any given country to move up the value chain is in essence unbounded. Robert Reich, who would go on to serve as Secretary of Labor in the Clinton administration,[2] put the argument thus:

> the global economy imposes no particular limit upon the number of Americans who can sell symbolic-analytic services worldwide. In principle, all of America's routine production workers could become symbolic analysts and let their old jobs drift overseas to developing nations. (1991)

The Knowledge Economy and the New Laissez-Faire

The knowledge economy is not just significant in terms of what it required policymakers to do; it is also significant in terms of what it did *not* require policymakers to do. We have seen already that the knowledge economy did not require redistribution in order to achieve social inclusion, as lack of wealth does not preclude economic success when growth is primarily driven by knowledge rather than capital. Using similar logic, some advocates of knowledge-based growth argued that governments need not worry about the emergence of potential monopolists, because low barriers to entry and high levels of dynamism made it easy to challenge dominant incumbents. To quote Charles Leadbeater, a former Downing Street adviser,

> If knowledge-based industries tend to create monopolies, the government cannot alter that, other than to choose which monopolist we have. The pace of change in these new industries is so fast that monopolies will rarely last. (2000)

While certain parts of the knowledge economy may be typified by winner-takes-all dynamics, any dominance is likely to prove temporary. Indeed, increases in the scale and resources of a business

are likely to decrease its agility, and thus sow the seeds of its own downfall: 'standard business thinking used to see big as inevitably beating small … now fast beats slow' (Blair 2000). Consequently, policymakers do not need to take a proactive approach to dismantling monopolies in the knowledge economy: 'it would be foolish for competition policy to back every self-styled David against its chosen Goliath … competition policy needs to focus on abuses of dominance, not on a strong position won fairly in the market-place' (Mandelson and Liddle 1996).

This prohibition against political intervention was also applied to industrial policy. Where governments intervene in the knowledge economy – for example, by subsidising or otherwise aiding particular domestic champions, so that they can achieve the scale needed to compete on the international stage – they will inevitably end up supporting inefficient, substandard businesses. The pace of change in the knowledge economy is so fast, the ratio of failures to successful businesses so high, that government attempts to pick winners will almost certainly damage innovation and growth overall: 'if IBM had been chosen as a national champion, and protected by government in the 1980s, its rising competitors, such as Apple, Microsoft and Intel, would probably have been frozen out' (Giddens 2000). The best that governments can do is to remove barriers to competition, incentivise investment, and increase rewards to risk-takers (DTI 1998).

Admittedly, not all commentators were critical of political intervention in the knowledge economy. For example, Joseph Stiglitz (who served as Chair of President Clinton's Council of Economic Advisers in the late 1990s) was an early advocate of knowledge-based growth, who nevertheless argued that the knowledge economy contained threats to competition that governments would need to counteract (1987, 1999). Furthermore, he emphasised the role of government in making big bets on technology, from supporting agricultural research in the nineteenth century through to the creation of the internet (1999). The more circumspect approach to the knowledge economy found in the work of Stiglitz and others provides a counterpoint to the more wholehearted techno-optimism of the likes of Anthony Giddens and Charles Leadbeater. Nevertheless, in UK policy circles at least, it seems that it was the optimists who won out: both Giddens and Leadbeater were able to adorn *fin-de-siècle* publications with approving quotations from Tony Blair, who said that Giddens' book *The Third Way and its Critics* was 'an important contribution to the debate', and that 'Charles Leadbeater is an extraordinarily interesting thinker [whose] book raises critical questions for Britain's future'.

The Limitations of Knowledge-Based Growth

The previous section has shown how the rise of the knowledge economy implied that investment in education, deregulation of labour markets, increased financial rewards for entrepreneurs, and international openness could deliver inclusive prosperity. Drawing on analyses of developments in the digital economy, automation, and globalisation over the last two decades, this section sketches how several of the core assumptions underpinning this largely benevolent vision of the knowledge economy have become increasingly problematic. Such an overview is necessarily schematic: a comprehensive survey of the literature on these topics, let alone the underlying data, is beyond the scope of any single article. Nevertheless, even a preliminary examination such as this reveals significant challenges to knowledge-based growth regimes.

Social Inclusion, Competitive Dynamism and the New Digital Economy

From a policymaker's perspective, one of the key attractions of the knowledge economy was its potential to facilitate social inclusion (understood as wider access to better work, and concomitantly higher levels of material prosperity) through 'social investment' in education and digital infrastructure, rather than more substantive forms of redistribution. This assumed potential can in part be attributed to an idealised understanding of the digital sector in the 1990s, and of the business model of software companies in particular. In the software industry, an individual wanting to develop a new program faces minimal start-up costs, assuming they have the requisite skills and

access to basic hardware. Development costs involve little more than the cost of their time; for digital products, manufacture and distribution costs are negligible. In short,

> Everyone with an education can have a go … Twenty-five-year-old drop-outs can create best-selling computer games; a nerd fresh out of college can create the Internet's best browser. (Leadbeater 2000)

The archetypal business of the 1990s' knowledge economy – wherein the knowledge worker could expect to be well-rewarded and well-treated, because otherwise they could easily move to another company or strike out on their own – was thus a software company, with Microsoft as the most oft-cited exemplar (Giddens 2000, Leadbeater 2000). Contemporary analyses portrayed Microsoft's people as its main asset, alongside the intellectual property that these people had developed. While Microsoft enjoyed substantial advantages associated with its market dominance – notably including the network effects arising from ownership of the 'standard' for documents, spreadsheets, and operating systems (Economides 2001) – it nevertheless sold a clearly defined product, produced by the knowledge work of its employees, with near-zero marginal costs of production and distribution once said product had been developed.

By contrast, while the archetypal businesses of the new digital economy do involve software of some description – such as Facebook's apps, or Google's search algorithm – their business model is very different. The software that these businesses produce is given away for free, and they then sell market insight gleaned from users' interactions with their platforms, and advertising space integrated into those software platforms themselves (Srnicek 2016). This signals a shift away from the knowledge economy model in which employees were companies' main assets. Whereas computer programmers were central to the archetypal business of the old knowledge economy, for a company such as Facebook or YouTube it is users themselves who play a dominant (but primarily uncompensated) role in value creation. Under the business models of 'Web 2.0' (O'Reilly 2007), users create content for other users to consume, such as text, photos, and film; their interactions with proprietary platforms create additional data which platform owners can then use to improve the platform, refine algorithms, and to generate insights to third parties (often for marketing purposes); these interactions also create channels for advertisers. Lack of users, and the costs of cultivating a user base large enough to make such a business model viable, thus act as substantial barriers to entry in the new digital economy.

This makes it difficult to challenge today's dominant digital companies. Whereas the knowledge economy assumed that incumbents were constantly under threat from the creation of new pieces of software or new websites, which could be created from scratch by any tech-savvy individual, replication of the economies of scale and network effects enjoyed by the likes of Facebook is far harder (Haucap and Heimeshoff 2014). While challengers to large incumbents can arise, these emergent companies require substantial capital investment to finance them through often lengthy periods of losses while they grow their user base. The new digital economy no longer appears as dynamic as the 1990s' software industry.

Software companies were not the only kind of business referenced by advocates of the knowledge economy: financial services, the creative industries, and science and engineering firms were also heralded as having high potential for knowledge-based growth (Leadbeater 2000). Yet, interestingly, not all of these sectors display the low barriers to entry deemed characteristic of the knowledge economy. While start-ups in fields such as advanced manufacturing, pharmaceuticals and bio-technology can form around a small set of core employees with good ideas, such businesses still need to attract capital to take these innovations through lengthy trial processes to market. The kind of 'innovation' celebrated in financial services during this period involved the invention of 'the most modern instruments of finance' (Brown 2006) – instruments that presuppose access to substantial reserves of capital (substantially larger reserves than the financial services sector possessed, as it transpired). Of the sectors celebrated by early advocates of the knowledge economy, only the creative industries displayed similar characteristics to software companies, with relatively low start-up costs beyond the time invested by creative individuals themselves (Garnham 2005). Yet growth of high-quality

knowledge jobs in areas such as advertising, journalism and broadcasting has stalled, in part due to the impact of tech giants such as Facebook, Google and (Alphabet-owned) Youtube on these industries. In the decade from 2007 to 2017, graduate recruitment into media companies experienced the most dramatic decline of any UK sector, with vacancies falling by over 50 per cent (High Fliers Research 2017).

Whereas policymakers once believed education, labour market flexibility, and increased financial incentives for success would be sufficient to spur entrepreneurial activity and job creation in the knowledge economy, it appears that this is no longer the case. Recent data on US start-ups indicates a dramatic decline in the number of high-growth young firms being created (Decker *et al*. 2016). The same downward trend in start-up rates is observable in many other developed democracies too, a trend that pre-dates the financial crisis (Criscuolo *et al*. 2014). These findings are unsurprising: if barriers to entry in the knowledge economy are higher than policymakers hitherto assumed, supply-side interventions such as public investment in education or lower taxes are unlikely to deliver competitive dynamism in and of themselves. Access to capital becomes once again an important determinant of success. In a less dynamic, more capital-intensive marketplace, knowledge workers have fewer opportunities to strike out on their own, and there are fewer businesses in desperate need of their skills. Under these circumstances, the disempowerment of workers arising from the removal of statutory employment rights and collective bargaining arrangements is unlikely to be counterbalanced by an increase in their marketability.

Automation, Work and Job Polarisation

Critical to marketability-based empowerment, and indeed to the appeal of the knowledge economy as a whole, was the promise of a surfeit of highly-paid, highly-skilled jobs for the citizens of developed democracies. True, even optimistic advocates of the knowledge economy recognised that technological progress would lead to changes in the nature of work, and to the loss of certain types of routine jobs. However, they anticipated that the knowledge economy would generate proportionately more new opportunities for better work, and consequently that technological and economic change could improve the lot of the overwhelming majority.

To some degree, these aspirations have been realised. Data compiled by Goos *et al*. (2014) shows that, between 1993 and 2010, middle-paying jobs (such as clerical workers and semi-skilled machine operators) declined as a percentage of the labour market in each of the 16 EU countries they examined. In most cases, this decline was primarily compensated by an increase in the share of employment in higher-paying occupations such as corporate managers, healthcare professionals, and engineers (see Figure 3). For citizens of these countries at least, the rise of the knowledge economy did appear to offer workers the chance to move up the value chain and into more skill-intensive employment.

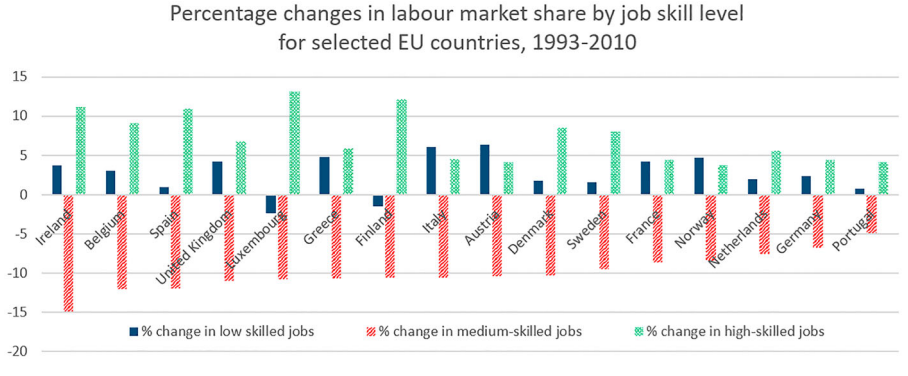

Figure 3. Changes in labour market share by job skill level, 1993–2010.

However, in three out of the 16 countries surveyed, growth in the share of lower-paid jobs such as unskilled manual labour and personal care work outstripped growth in the share of higher-paying occupations. Moreover, in four of the remaining 13 countries (including the EU's three largest economies, France, Germany and the UK), the rate of growth in the share of low-paid occupations was at least half that of the growth in high-paid occupations. In other words, the rise of the knowledge economy was not associated exclusively with new higher-skilled job opportunities, but also with a concomitant expansion in lower-paid roles: a polarisation of the job market.

Put simply, it appears that knowledge jobs are not as plentiful as proponents of the knowledge economy once anticipated. This becomes less surprising when we consider how the business models of the new digital economy can render erstwhile knowledge-workers redundant: digital platforms such as Uber, Deliveroo and TaskRabbit substitute for managerial labour, coordinating large workforces using algorithm and customer feedback instead of middle-class employees. Moreover, advances in machine learning and artificial intelligence threaten cognitive work that until recently was thought to be inefficient or impossible to automate (Brynjolfsson and McAfee 2014). As the former Labour politician Ed Balls perceptively writes, 'we didn't see … that technology would pose as much of a challenge to the jobs and wages of the middle classes as the working classes, and perhaps more so' (2016).

There are concerns that the coming wave of automation – variously billed as a second machine age (Brynjolfsson and McAfee 2014), a fourth industrial revolution (Schwab 2017), or a technological singularity (Shanahan 2015) – might further exacerbate this trend. Commentators predict that automation will continue to erode mid-skilled, mid-paid jobs: the soft skills of customer service staff are increasingly under threat from automated chatbots, and the perception-reaction skills of haulage workers might soon be rendered redundant by the widespread adoption of driverless vehicles. In white-collar sectors such as law and journalism, artificial intelligence can already perform tasks such as document research and copywriting (Croft 2017, Keohane 2017). Admittedly, only the more routine aspects of these tasks can currently be automated. Nevertheless, unless the elasticity of demand for legal services or journalistic output is such that demand will increase in lockstep with rising productivity and falling prices, even this kind of automation will lead to the loss of existing high-skilled jobs. This has serious implications for the knowledge economy. What rendered the hollowing out of mid-skilled jobs (and with it, the shift towards greater labour market flexibility and consequently reduced job security) not just tolerable but desirable was the promise of an abundance of high-skilled jobs in their place. The new automation paradigm directly challenges this benign vision of the future.

To be sure, fears that the automation-driven reduction of demand for labour in particular sectors and occupations will result in mass unemployment are almost certainly overstated (Autor 2015). Other things being equal, the rising income level in society as a whole implied by these productivity advances will mean a shift in demand from sectors with low demand elasticity (such as food and other necessities) to sectors where demand elasticity is higher (services or luxury goods). In some sectors, it seems difficult to discern a point at which demand could ever be satisfied – notably in healthcare, where spending continues to grow despite (indeed, in part because of) productivity advances brought about by pharmaceutical research and new medical machinery, and the life expectancy increases associated with them (White 2014).

What really matters, from the perspective of the progressive case for the knowledge economy, is whether the new work that is created compensates workers sufficiently for the jobs that have been lost. To date, it is debatable whether this has been the case. Over the last two decades, diverse advanced economies have witnessed substantial productivity growth, reflecting the benefits of technology and innovation. However, during the same period, median wage levels have stagnated in most OECD countries (Schwellnus *et al*. 2017).

This picture becomes even starker towards the bottom of the income distribution. Recall that knowledge-based growth was intended to tackle the social exclusion resulting from the market liberalisation of the 1980s. However, skills-based interventions have been remarkably poor at

remedying the problem of low-paid low-skilled work. In the UK, for example, the upskilling of low-paid workers has had minimal impacts on their earning ability, due to a lack of demand for the skills these workers are likely to acquire, and a lack of opportunities for promotion for low-paid workers (Lloyd and Mayhew 2010). This is consistent with job polarisation: a decrease in mid-paid, mid-skilled jobs provides fewer opportunities for progression for those at the bottom.

In summary, then, the reality of job creation in the automation era falls short of the optimistic predictions made twenty years previously. Growth in high-skilled knowledge jobs has been accompanied by a significant expansion in low-paid, low-skilled jobs. The decline in middle-skilled employment blunts the potential benefits of educational interventions targeted at the lower-skilled end of the distribution. Advances in artificial intelligence and automation, as well as the business models that dominate today's digital economy, mean there is a chance that this trend towards job polarisation may continue, with increasing numbers of today's knowledge jobs also under threat. The claim that knowledge-based growth regimes will deliver an abundance of financially rewarding and cognitively stimulating work appears questionable at best.

Economic Openness, Regional Inequality and Knowledge-Based Growth

As we have seen, for early proponents of the knowledge economy, openness to globalisation was vital if countries were to reap the benefits of knowledge-based growth. This openness allowed knowledge-intensive economies to sell their innovative ideas and services to a wide range of markets, and to import the lower value-add physical goods and services they still consumed from elsewhere. Economic openness also provided inflows of talented workers, investment capital and ideas, enabling knowledge businesses to maintain and enhance their global competitiveness.

However, some groups within developed democracies have seen little reward for this openness. As mentioned above, the rise of the knowledge economy is associated with the expansion of both high-paid and low-paid jobs in an economy. The geographical distribution of high-skilled knowledge work is extremely uneven, often exacerbating pre-existing patterns of interregional inequality (Scott 2008, Rosés and Wolf 2018). Economic openness can deepen these inequalities yet further: generally speaking, the more economically integrated a country is with the rest of the world, the more extreme its levels of regional inequality will be (Ezcurra and Rodríguez-Pose 2013). This is unsurprising, given globalisation can mirror the effects of automation, with both robots and foreign labour acting as substitutes for traditional semi-skilled jobs. Nevertheless, this means that, for some communities, globalisation has destroyed existing jobs without bringing with it the compensatory benefits of knowledge-based growth.

Compounding this, people in unfavoured areas may find themselves competing against migrant labour for whatever lower-skilled jobs are available locally. This can exert downward pressure on salaries, which in the UK at least are already further down the income distribution than those paid by the industrial employers of the past (Nickell and Saleheen 2015). It may also reduce incentives for employers to invest in upskilling the domestic population (Coulter 2018). For people in these locations, the social contract of the knowledge economy – where better-paid, higher-skilled work was promised in exchange for economic openness – has not been fulfilled.

The ambiguity of economic openness in an era of knowledge-based growth is not solely a question of the impacts of globalisation on the 'left behind'; it can also be seen at the level of competition in particular sectors. True, inward investment by multinational firms operating at the global technological frontier may introduce productive new innovations to a country. However, where such firms' strategies entail seizing first-mover advantage, harnessing network effects and economies of scale that make them all but unassailable by would-be domestic challengers, openness to foreign investment may simply mean foreign ownership of monopoly rents. In recent years, a number of Chinese tech companies have been able to achieve dominant positions – domestically and regionally – in markets such as search (Baidu), e-commerce (Alibaba) and social media (Weibo and WeChat). It is an open question whether they would have enjoyed such success had the Chinese government

not placed obstacles in the way of competition from overseas tech firms. Similarly, the success of domestic taxi-hailing apps in countries such as Iran (Stepp), India (Ola) and Spain (Cabify) may owe something to the regulatory barriers in place in this particular market sector, which have given domestic businesses a vital reprieve from overseas competitors such as Uber.

More broadly, emerging economies such as India and China have sought to capitalise on knowledge-based growth in their own right, diluting the impact of pro-knowledge policies in the developed democracies. The knowledge economy was initially presented as a means by which the citizens of developed democracies could maintain competitive advantage in a globalised era: tolerant, open, liberal, multicultural societies supposedly excelled in creativity and innovation, cultivating knowledge-based growth (Leadbeater 2000). However, emerging economies too have prioritised investment in skills that enable them to compete at the top-end of global value chains, and multinational companies have unsurprisingly attempted to source knowledge workers in locations where labour costs are lower (Brown and Lauder 2006). International competition has thus limited the growth of high-skilled knowledge jobs in developed democracies, contributing to the gap between the claims made on behalf of the knowledge economy in the past, and the experience of knowledge-based growth today.

The Knowledge Economy: A Growth Regime in Crisis?

This article has argued that the realities of knowledge-based growth over the last twenty years have fallen short of the predictions made by a previous generation of politicians and policymakers. Mismatches between political rhetoric and economic reality are of course nothing new. What is interesting in the case of the knowledge economy is how several of the assumptions made about the characteristics of knowledge-based growth in the 1990s appear questionable in light of the subsequent trajectory of technological change and socioeconomic development. This suggests that the mismatch between the rhetoric and the reality of the knowledge economy may reflect deeper problems of policy – namely, flaws in the understanding of the economy on which policy interventions were premised – over and above everyday problems of politics such as exaggeration, hubris, and flawed implementation. If the business models that thrive in the knowledge economy are capital-intensive tech corporations that require significant investment until they achieve market dominance, then education alone is unlikely to deliver either social inclusion or competitive dynamism. If automation and new digital platforms imply a substantial expansion of low-skilled as well as high-skilled jobs, then the implications of technological change are at best ambiguous for the average worker. If international openness can be detrimental as well as advantageous to the development of domestic knowledge-businesses and knowledge-workers, then unqualified embrace of international flows of goods, services, people and capital may be unadvisable.

It is important to stress the preliminary nature of this analysis, focused as it is on the concept of the knowledge economy prominent in UK policy circles during the Blair era. There is more work to be done to understand how differing ideas about the knowledge economy informed public policy in other countries, as well as to examine differences between countries' experiences of knowledge-based growth. Moreover, while we have provided a high-level sketch of trends that call into question key assumptions of knowledge-based growth regimes, further work is needed to fully explore the implications of the new digital economy, technological progress and globalisation for the knowledge economy. Finally, to the extent that growth regimes are not just technocratic strategies, but also social contracts specifying the rights, responsibilities and expectations of a wide range of actors, the problems facing knowledge-based growth regimes might also create faultlines in the diverse socio-political coalitions that supported knowledge-based growth. It may thus be fruitful to explore the political ramifications of the shortcomings of knowledge-based growth.

However, for all the limitations of the present analysis, it does at the very least call into question the assumptions of knowledge-based growth, and thus the public policy agenda constructed around it. Given what we have learned about knowledge-based growth over the intervening years, public

policies advocated in the heyday of the knowledge economy concept appear unlikely to generate the kind of outcomes that their proponents once anticipated. It follows that simply doubling-down on a supply-side agenda of labour market deregulation, investment in education and improved digital infrastructure is unlikely to radically change the pace and character of economic growth in developed democracies, in and of itself. Yet, as outlined in the introduction to this article, influential institutions and individuals continue to emphasise supply-side reform. Our analysis suggests developed democracies may need to do more to address the challenges they face today.

Notes

1. For a discussion of shifts in macroeconomics that complements Hall's analysis, see Vines and Wills (2018).
2. On the influence of Clinton-era officials on New Labour, see The Economist (1997).

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