

Regulating For Growth

By Matthew Feeney



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About the Author

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Executive Summary

Britain led the way in the Industrial Revolution. But today it is stuck in economic stagnation, with low GDP and GDP per capita growth and a technology sector that is failing to live up to its potential.

Fortunately, the UK enjoys enviable comparative advantages, such as elite academic and research institutions, a trusted and stable English-speaking legal framework, an established and well-respected financial sector and freedom to craft regulation independent of the European Union.

Yet the Government has not seized on these comparative advantages. Instead, it continues to oversee a costly and complex regulatory apparatus that hampers the British technology sector's potential.

‘ We need to make Britain the natural home of new discoveries and new industries that can drive growth ’

In its recent paper ‘The Future of Regulation’, the Centre for Policy Studies highlighted the dysfunction of the UK’s regulatory state and the shortcomings of successive governments’ attempt to reverse the inexorable accretion of fresh regulation.

That paper outlined a clear vision for how we can reshape the process of regulation, bringing transparency and accountability to the regulatory state.

This companion paper, however, looks specifically at technology and innovation – and in particular how we can reshape our regulatory structures to make Britain the natural home of the new discoveries and new industries that can drive growth and help us escape from our economic stagnation.

It explores the history of past technologies, and the obstacles they have faced, arguing that what is needed is a regulatory system in which innovators and entrepreneurs do not have to apply to the state for permission to innovate.

We therefore argue that the Government should:

- 1) Revamp the British regulatory state by embracing permissionless innovation, putting the private sector in the position of asking the government for forgiveness rather than permission.
- 2) Require each regulator to publish policy charters that establish a set of safety standards imposed on regulated products and practices, as well as an outline of the likely and significant harms that such standards are intended to prevent.
- 3) Establish an office with a designated minister to oversee regulatory reform with the authority to exercise veto power over new regulatory initiatives across Whitehall, in the same way as the Chancellor does with spending decisions.

A country that does not have a regulatory structure that is nimble and flexible enough to respond to innovation – whether that be AI advances and synthetic drugs, or developments in nuclear energy or space flight – risks being left behind. This is a challenge not just for ministers and regulators, but for all of us. It is one we have to rise to.

Introduction

Britain's contributions to innovation are among its most notable achievements. British inventors, engineers and scientists invented the steam engine, the locomotive, electric motors, the Spinning Jenny, the water frame and countless other products that helped fuel successive industrial revolutions. More recently, British innovation and ingenuity gave the world the World Wide Web, the first cloned mammal, and the first practical atomic clock.

But is Britain still an innovation society?

There's certainly a case that innovation has stalled across the West – a case made powerfully by the economist Tyler Cowen, who coined the phrase 'The Great Stagnation' to describe this phenomenon.

Take the actor Alec Guinness, who was born in 1914 and died in 2000. He lived through the emergence of commercial airlight, the Apollo program, the rise of the computer, mobile phones, the first satellites, nuclear power, animal cloning, test tube babies, the first organ transplant, genetically modified crops, as well as the proliferation of indoor plumbing, telephones and televisions.

‘It would be foolish to downplay the benefits of near-instant global communication. But it is nonetheless the case that for many young people today the most significant technological change has taken the form of new software rather than hardware’

Someone born in, say, 1970 will have seen plenty of change – not least improvements in computers, phones, televisions, aeroplanes and cars. But these have generally been advances on familiar products rather than new categories of products themselves. The Bugatti Veyron is a fast car with an impressive engine, and the Airbus A380 can carry 853 passengers in the air, but someone from 1924 would still recognise them as a kind of car and a kind of plane a century later. Move someone from 1850 to 1950, and 'telephone' and 'television' would not be in their vocabulary.

The proliferation of the internet is a notable exception to the relatively stagnant state of innovation. It would be foolish to downplay the benefits and revolutionary effects of near-instant global communication via devices that can fit in a trouser pocket. But it is nonetheless the case that for many young people today the most significant technological change has taken the form of new software rather than hardware; 'innovation in the world of bits, but not in the world of atoms'.¹

Of course, changes in the world of bits have led to life-changing innovations. Recent developments in AI such as DeepMind's protein-folding work and ChatGPT are

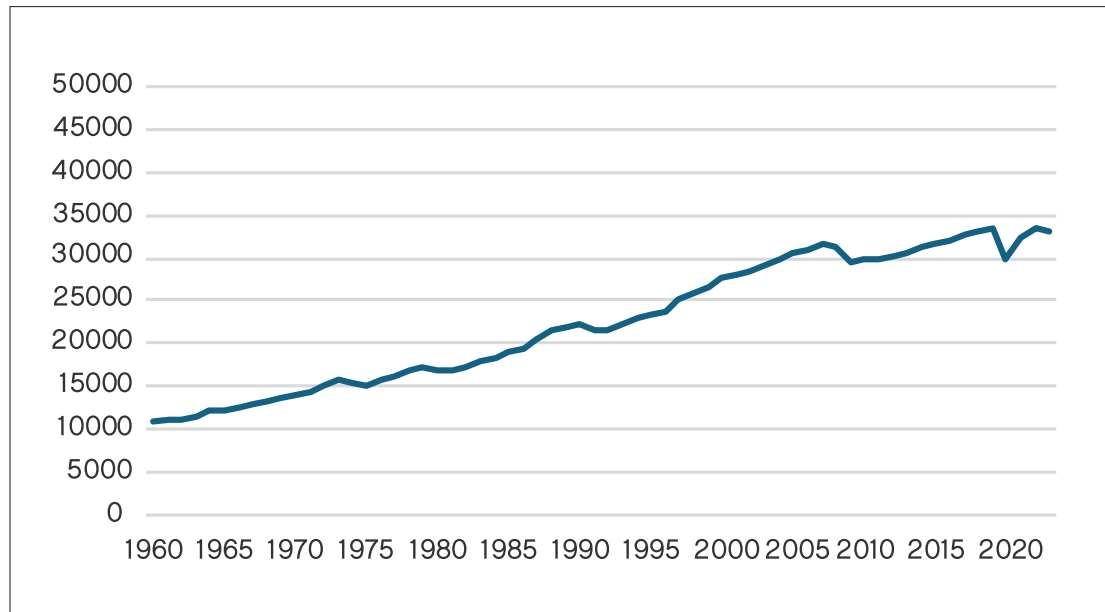
¹ Michael J. Miller, 'Peter Thiel: We've Seen Innovation in Bits, But Not Enough in Atoms', PC Mag, October 10, 2014. [Link](#)

particularly exciting. And there is an argument that the ‘Great Stagnation’ looks less static when we take a view of progress wider than GDP.² Cowen himself has said that the era of relative stagnation is over.³

But the question is: is Britain best positioned to take advantage of that?

The most striking – and depressing – feature of British life in recent decades has, after all, been the lack of growth. From 1970 to 1990, for example, British GDP per capita rose by roughly 60%.⁴ Yet someone born in the UK in 2000 has not only seen innovation slow down, but growth slow down too – rising by just 8% or so over the same number of years.⁵

UK Gross Domestic Product per capita (in £)



Source: Office for National Statistics

Young adults in the UK are poised to be the first generation in more than a century to not live through rapid technological change and significant economic growth. AI innovations hold potential to change this, but policymakers should not bet on the success of a particular set of products – especially not when other countries, not least the United States, seem better positioned to capture much of the economic value created.

If Britain wants both innovation and growth, we need to make ourselves a better place to innovate. One of the advantages of Brexit is that the UK is – at least in theory – free to craft a world-class regulatory framework for new and emerging technologies. With the right policies in place, the Government can position the UK as a global leader in technology regulation, ushering in an era of renewed entrepreneurship, innovation and economic growth.

But what are those policies?

This paper argues that recent history provides key lessons for lawmakers and regulators seeking novel approaches to new and emerging technologies. The history of how

² Adam Hunt, ‘There Was No Great Stagnation’, Works in Progress. October 12, 2022. [Link](#)

³ Tyler Cowen and Jon Baskin, ‘Progress Studies A conversation with Tyler Cowen’, The Point, February 22, 2023. [Link](#)

⁴ Gross domestic product (Average) per head, CVM market prices: SA, Office for National Statistics, May 10, 2024. [Link](#)

⁵ Ibid.

technologies such as Bitcoin, the gig economy, drones, lab-grown meat, aeroplanes, and autonomous vehicles were treated by regulatory agencies helps showcase how hard it can be to adapt the regulatory landscape – and in particular the difference between technologies that are ‘born captive’ into pre-existing regulatory environments and technologies that are ‘born free’.

A frank assessment of challenges and opportunities should be at the heart of any attempt to build a regulatory regime aimed at boosting technological innovation and growth.

Accordingly, this paper begins with a discussion of the current costs of regulation and the state of the British economy, as well as an overview of the UK’s homegrown advantages such as its elite academic institutions, established technology markets, and a head start in life science research.

**‘ Entrepreneurs and inventors need
to be in the position of asking the state
for forgiveness rather than permission ’**

Next, the paper outlines a regulatory framework that can reform how our roughly 90 regulatory agencies treat regulation, and in particular can ensure that businesses, researchers, entrepreneurs and inventors are in the position of asking the government for forgiveness rather than permission, allowing them to innovate, launch new products, and safely conduct tests.

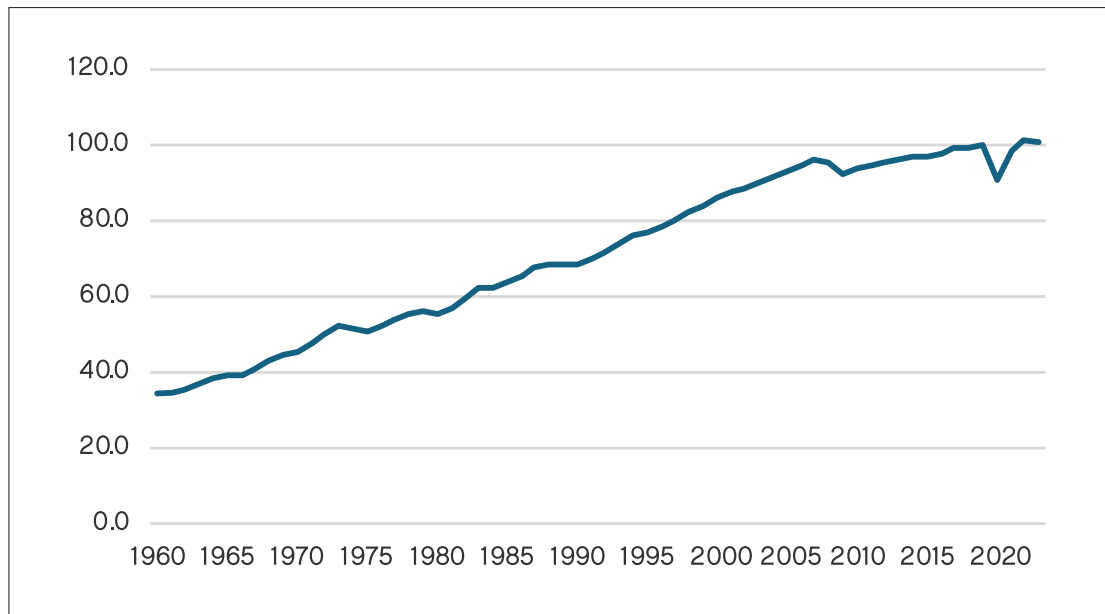
Key to this new framework would be policy charters, backed by Parliament, outlining regulatory safety standards aimed at preventing likely and significant harm. With such standards in place, businesses, researchers and investors would be reassured that they were free to bring their goods to market and to experiment with new and emerging technologies, provided that they committed to abiding by a clear set of safety standards.

The paper concludes with proposals for a regulatory sunset scheme and the establishment of a minister dedicated to review of existing regulations and the implementation of the regulation policy charters, building on a sister paper recently published by the Centre for Policy Studies, ‘The Future of Regulation’.

Part One: An Innovation Nation?

The United Kingdom faces many economic challenges. GDP per capita has barely recovered from the 2008 crash, while total factor productivity has yet to recover.⁶ Annual GDP growth is on a downwards trend, having decelerated for several decades.⁷ For most of the last half-century, worker output per hour increased at a steep rate: by about 61% between 1960 and 1980,⁸ and by around 55% over the 20 years after that.⁹ Yet between 2000 and 2022, it only increased by 17.5%.¹⁰

UK Output per Worker 2019=100



Source: Office for National Statistics

The costs of regulation are by nature impossible to know for certain, as we can never know the cost of what never occurs.¹¹ Yet estimates based on comparable economies have found that they may be between 10% and 12% of GDP, or roughly £220 billion to £264 billion.¹² These costs affect all sectors, including the technology sector. And the recent Centre for

6 University of Groningen and University of California, Davis, Total Factor Productivity at Constant National Prices for United Kingdom [RTFPNAGBA632NRUG], retrieved from FRED, Federal Reserve Bank of St. Louis; [Link](#), April 3, 2024.

7 International Monetary Fund, 'UK Real GDP Growth: Annual Percent Change'. [Link](#)

8 Office for National Statistics, 'Output per Worker: Whole Economy SA: Index 2019=100: UK', February 15, 2024. [Link](#)

9 Ibid.

10 Ibid.

11 'In one respect, the true costs of regulation are unknowable – because they are about things that never actually happen. How do you measure the cost of a business never getting off the ground? Or an invention never coming to market? Or a career spent managing regulatory risk instead of supplying goods or services that consumers want, need, or simply enjoy?' The Future of Regulation by Tom Clougherty & Robert Colvile

12 Better Regulation Task Force, 'Regulation – Less is More', March 2005, p. 12. [Link](#)

Policy Studies report ‘The Future of Regulation’ made clear that these costs are not only on the increase but substantially underestimated by the current system of regulatory accounting, not least because very few people in Whitehall actually take it seriously.¹³ (For example, only one department actually has a full list of all the regulations it has imposed.)

In terms of tech firms in particular, the UK is certainly home to a number of successful companies – indeed, ministers boast constantly about the number of ‘unicorn’ firms it has produced. Yet most of these firms are often funded by, and ultimately sold to, overseas investors. In 2021, for example, foreign investors accounted for 75% of the capital invested in UK tech startups.¹⁴ Indeed, the UK has become what one startup investor described as a cheap ‘technology sweetie shop’.¹⁵ In contrast to their counterparts in countries like America, Canada or Australia, Britain’s pension funds have historically been comparatively risk-averse and hesitant to invest in high-growth sectors. That tendency has been encouraged by regulation: it was only last year that the Chancellor announced that the Treasury would implement reforms aimed at boosting such investment.¹⁶

‘The UK has become what one startup investor described as a cheap ‘technology sweetie shop’.’

The Government has put forward plans for growing the British technology sector and has expressed a strong commitment to AI research and investment. But the UK’s strengths are relatively concentrated, in areas such as fintech. In manufacturing, we lag well behind other countries when it comes to use of robots. South Korea, Japan, Germany, the USA, Slovenia and Spain are a handful of the many countries with more industrial robots per capita than the UK.¹⁷ In fact, the UK’s density of industrial robots is below the world’s average.¹⁸

Furthermore, the Government’s rhetoric in support of the technology sector is often at odds with its legislative agenda – and with the behaviour of its regulators. As the CPS has repeatedly pointed out, the Online Safety Act imposes a range of costly duties on thousands of British businesses while also putting citizens’ privacy, security and free speech at risk. It will also threaten senior executives at online services and firms with prison time if they fail to adhere to some of the law’s duties.¹⁹

Then there is the Digital Markets, Competition and Consumer Bill. This would impose eye-watering fines of 10% of global annual turnover on big tech firms, and empower the Competition and Markets Authority’s Digital Markets Unit (DMU) to stifle innovation by issuing ironically named ‘pro-competition interventions’ when it believes that a new digital innovation could hamper competition. Had the DMU been in place years ago, Google would have needed permission to launch Google Maps and Amazon would have needed permission to launch Amazon Prime.²⁰ Such legislation hardly makes the UK look open to technology business.

13 Tom Clougherty and Robert Colville, ‘The Future of Regulation’, Centre for Policy Studies, Tuesday, April 23, 2024. [Link](#)

14 ‘£75bn startup pension boost for UK tech companies’, Harper James, July 21, 2023. [Link](#)

15 Peter Foster and Daniel Thomas, ‘The UK’s dream of becoming a ‘science superpower’’, Financial Times, January 5, 2023. [Link](#)

16 ‘£75bn startup pension boost for UK tech companies’, Harper James, July 21, 2023. [Link](#)

17 Brianna Wessling, ‘10 most automated countries worldwide’, The Robot Report, December 15, 2021. [Link](#)

18 Rian Chad Whitton, ‘Britain’s exceptional lack of automation’, Doctor Syn Substack, July 27, 2022. [Link](#)

19 Jessica Kingsbury, ‘Criminal Liability for Senior Managers under the Online Safety Act’, Reynolds Porter Chamberlain LLP, October 5, 2023. [Link](#)

20 Ryan Bourne, ‘Consumers will lose out if Big Tech has to seek permission to innovate’, The Times, March 31, 2022. [Link](#)

In short, the UK is home to many exciting technology companies and innovative talent. Sadly, as Tyler Cowen told the CPS's annual conference in 2022, 'The problem is [the UK's] biggest successes come in ideas production, and those are public goods. So, the nation – the United Kingdom – doesn't actually benefit that much from them.'

In particular, in addition to the costs of regulation, the lacklustre state of technology investment, and the legislative tendency to threaten technology companies with significant fines and criminal penalties, would-be innovators also face a regulatory apparatus that struggles to adapt to new and emerging technologies, which oftentimes do not fit neatly into current regulations.

At a time when cars look more and more like computers with wheels, people are increasingly eating food grown in labs rather than pastures, and customers expect GPS-tracked deliveries on their phones, it is critical that ministerial departments and regulators are flexible enough to resist imposing regulatory jurisdiction over new and emerging technologies. Because if they can do so, there are huge opportunities.

‘ Britain continues to provide opportunities
for those seeking to be part of a new
wave of technology and innovation ’

The innovation opportunity

Although the state of the UK's economy is hardly cause for celebration, the UK continues to provide opportunities for those seeking to be part of a new wave of technology and innovation.²¹ It is home to some of the world's best universities and research institutes as well as the Golden Triangle - the biotech and life sciences cluster with Cambridge, Oxford and London at its corners.

British life science innovation made global headlines during the pandemic. The UK played a leading role in vaccine development and was the first country to administer a Covid-19 vaccine. It ran the trials that discovered the most effective treatments for those with Covid, with one finding alone estimated to have saved one million lives.²²

The sector has been making other contributions to potentially life-saving and life-changing technologies and research related to cancer treatment, vaccine development and dementia.²³ It is not a surprise, therefore, that the UK attracts foreign investment. In 2022, its life sciences sector attracted more equity funding than all but three other countries.²⁴

The UK is also well known as a centre for AI research. DeepMind, which Google acquired in 2014, has made a number of AI breakthroughs such as building AlphaGo, which defeated world Go champion Lee Sedol in 2016; AlphaFold, which can quickly predict protein physical structures; and a program that can control plasma in nuclear fusion reactors.²⁵ These breakthroughs have the potential to contribute to civilization-changing revolutions in medicine and energy.

21 Aria Babu, 'No relief in sight: a few simple tax changes could fatally undermine UK startups', CapX, March 2, 2023. [Link](#)

22 NHS England, 'COVID treatment developed in the NHS saves a million lives', March 23, 2021. [Link](#)

23 Ibid.

24 Department for Science, Innovation and Technology and Department of Health and Social Care, 'Life sciences competitiveness indicators 2023 - GOV.UK'. [Link](#)

25 Amit Katwala, 'DeepMind has Trained an AI to Control Nuclear Fusion', *Wired*, February 16, 2022. [Link](#)

AI companies in the UK are working on a wide range of other problems and across a variety of sectors. The majority of AI investment in the UK has been focused on fintech, marketing and advertising, healthcare, and entertainment.²⁶

It is welcome news that the UK is globally recognised as a leader in AI and life sciences. But it would be a mistake to design a regulatory framework with the protection and success of these industries in mind. An ideal regulatory framework will not pick winners and losers but rather level the playing field so that any new and emerging industries have the chance to grow in the UK.

With Brexit complete, the government is free to craft a British regulatory framework that will encourage innovation, entrepreneurship, and economic growth. But as this paper will show, this unprecedented opportunity is largely being squandered. This is a tragedy because with the right policies in place, the UK could lead the world by example, showcasing a regulatory framework for the 21st century.

As the government considers regulations for new and emerging technologies, it is vital for ministers and civil servants to reflect on the history of many recent technological developments, and how the regulatory state dealt with them – and how we can do better in future. In the next section, we briefly sketch a few illustrative examples, and the lessons they can offer.

‘It is welcome news that the UK is globally recognised as a leader in AI and life sciences. But it would be a mistake to design a regulatory framework with the protection and success of these industries in mind’

Bitcoin

On 31 October 2008, the pseudonymous Satoshi Nakamoto published the Bitcoin white paper.²⁷ ‘Bitcoin: A Peer-to-Peer Electronic Cash System’ proposed the creation of a decentralised digital currency. A few months later, ‘Nakamoto’ launched the project. The first block of the chain contained a UK headline, ‘The Times 03/Jan/2009 Chancellor on brink of second bailout for banks’, suggesting that Nakamoto may have been motivated by the financial turmoil of 2007-8.²⁸

Bitcoin is a classic example of what the American technology policy scholar Adam Thierer calls a ‘born free’ technology.²⁹ When the Bitcoin white paper appeared there was no Ministry of Blockchain, Bitcoin subcommittee, or All-Party Parliamentary Group on Cryptocurrency. The technology had been ‘born free’ of any legislative or regulatory constraints. Indeed, for most of its early history Bitcoin garnered a reputation as a relatively benign, utopian project for tech-oriented anarchists and libertarians.

But there were obvious policy implications. For example, although it posed no realistic threat to fiat currencies, Bitcoin did provide a means for millions of people to circumvent the fees associated with sending funds across borders. According to an analysis by the cryptocurrency research firm Chainalysis, in 2020 hundreds of millions of pounds worth of retail-sized transfers (less than \$10,000 USD) were sent to cryptocurrency wallets

26 Innovation Eye and powered by Big Innovation Centre and Deep Knowledge Analytics, ‘Artificial Intelligence Industry in the UK Landscape Overview 2021: Companies, Investors, Influencers and Trends (2nd Edition)’ [Link](#)

27 Satoshi Nakamoto, ‘Bitcoin: A Peer-to-Peer Electronic Cash System’, October 31, 2008. [Link](#)

28 Bitcoin block 0. [Link](#)

29 Adam Thierer, ‘What 20 Years of Internet Law Teaches Us about Innovation Policy’, Federalist Society, May 12, 2016. [Link](#)

based in Africa.³⁰ Such transfers, many of which included Bitcoin and were intended as remittances, avoided fees associated with international money transfers.³¹

Cryptocurrency remittance transfers also allowed users to avoid inflation, and cope with electricity blackouts. Latin Americans are increasingly using cryptocurrencies to send money home, since they offer an attractive hedge against inflation in countries such as Venezuela and Argentina.³² In the former, they also offer ease of access to funds compared to traditional financial services, which can frequently have their transfers delayed by blackouts.³³

In many jurisdictions, the security and privacy offered by Bitcoin also made using the cryptocurrency attractive. Authoritarian governments cannot shut down Bitcoin or prevent Bitcoin transfers. As such, Bitcoin and subsequent cryptocurrencies have become an attractive asset for dissidents and those seeking to circumvent authoritarian regimes. Activists in Thailand, Belarus, Nigeria, Hong Kong, and many other jurisdictions with limited or unstable civil liberties protection have accepted cryptocurrency donations, as did the Ukrainians in the wake of the Russian invasion.

‘ In many jurisdictions, the security and privacy offered by Bitcoin also made using the cryptocurrency attractive. Authoritarian governments cannot shut down Bitcoin or prevent Bitcoin transfers ’

If we do not hear much about the benign consequences of cryptocurrency, it is because Bitcoin and its cousins have made malign consequences that are far more headline-grabbing. The censorship-resistant nature of Bitcoin can frustrate authoritarian regimes, but can also allow for criminals to evade law enforcement. Black market websites such as Silk Road allowed users to buy illegal items online. Then there was the prevalence of fraud, not least via the collapse of the Mt. Gox exchange, and the enormous price volatility that has become all too familiar.

Inevitably, therefore, lawmakers and regulators around the world attempted to bring Bitcoin and the other currencies it spawned into the fold of regulation and law. In 2014, the British government issued its first call for information associated with cryptocurrencies.³⁴ The Government stated that ‘there is a good case for proportionate regulation at this time, to provide a supportive environment for legitimate digital currency users and businesses’.³⁵ Yet British citizens mined, bought and traded Bitcoin for almost 10 years before their Government set up the Cryptoassets Taskforce, consisting of HM Treasury, the Financial Conduct Authority (FCA) and the Bank of England, in March 2018.³⁶

Since then, the UK has become well-known as a home of sound cryptocurrency regulation.³⁷ The FCA has crafted Know Your Customer (KYC), anti-money laundering (AML), and combating the financing of terrorism (CFT) regulations, providing

30 ‘Remittances and Fiat Currency Devaluation Drive Africa’s Growing Cryptocurrency Economy, and Big Exchanges Recognize the Opportunity’, Chainalysis, September 8, 2020. [Link](#)

31 ‘Many African countries suffer from severe currency devaluation and instability, which makes it difficult for residents’ savings to hold their value. The South African Rand (ZAR), for example, has lost over 50% of its value against the U.S. dollar in the last decade and is consistently one of the most volatile fiat currencies. Nigeria, Egypt, Algeria, Ethiopia, and Ghana face similar issues with their own currencies.’ Ibid.

32 David Feliba, ‘Crypto retains lure in Latin America’s inflation hotspots’, Context, December 14, 2022. [Link](#)
Brian Ellsworth, ‘As Venezuela’s economy regresses, crypto fills the gaps’, Reuters, June 22, 2021. [Link](#)

33 Brian Ellsworth, ‘As Venezuela’s economy regresses, crypto fills the gaps’, Reuters, June 22, 2021. [Link](#)

34 HM Treasury, ‘Digital Currencies: Response to the Call for Information’, March 2015. [Link](#)

35 Ibid.

36 HM Treasury, Financial Conduct Authority, Bank of England, ‘Cryptoassets Taskforce: Final Report’, October 2018. [Link](#)

37 Thomas Reuters, ‘Cryptocurrency regulations by country’, April 2022. [Link](#)

cryptocurrency exchanges with clear legal requirements to operate. HM Revenue and Customs (HMRC) has avoided instituting cryptocurrency-specific taxes, choosing to tax cryptocurrency received from an employer as ‘money’s worth’ and cryptocurrency sold for profit as capital gains.³⁸

In its response to the Government’s 2014 call for information, HM Treasury emphasised the need to provide clarity, prevent criminal activity, and support research in the growing blockchain industry.³⁹

Notably, although Bitcoin and blockchain technology were new, the Government resisted creating a new regulatory body, making the FCA the main regulator of the burgeoning industry. This approach acknowledged that the new technology posed similar risks to traditional financial products (fraud, money laundering, funding of criminal activity) while accepting cryptocurrencies’ unique features. Like many other governments, the British government imposed licensure obligations on cryptocurrency exchanges, while noting that cryptocurrencies have a ‘unique identity’ that distinguishes them from traditional investments.⁴⁰

‘When the Wright brothers flew their Wright Flyer in 1903, there were no flight safety regulations, pilot licences, or air traffic control towers’

Aeroplanes

We tend to think of debates over technology regulation as a new problem. But in fact, they go back decades.

Perhaps the most notable and consequential example of a ‘born free’ technology is the aeroplane. When the Wright brothers flew their Wright Flyer in 1903, there were no flight safety regulations, pilot licences, or air traffic control towers. The two bicycle enthusiasts were free to tinker with engines, propellers and airframes and pursue their goal of achieving heavier than air powered flight. The result changed human civilization.

A few years after the Wright brothers’ flight, another American, Samuel Cody, made the first aeroplane flight in British history, flying the British Army Aeroplane No 1 (also known as the ‘Cody 1’) in Hampshire in 1908. Yet the British government would not formally begin regulating civil aeroplanes until 1911.⁴¹

The early years of flying were very dangerous compared to today. Cody himself died in a plane crash in 1913. The life expectancy for the first US mail pilots was 900 flying hours.⁴² In 1919, one mail pilot died for every 115,325 miles flown.⁴³ Today, flying is by far the safest way to travel long distances. According to the International Air Transport Association, at recent levels of safety ‘on average a person would have to travel by air every day for 103,239 years to experience a fatal accident’.⁴⁴

Some might argue that the dramatic improvement in air flight safety is thanks to the safety regulations that have emerged around the world. But the lesson from the history

38 Ibid.

39 HM Treasury, ‘Digital Currencies: Response to the Call for Information’, March 2015. [Link](#)

40 Comply Advantage, ‘Cryptocurrency regulations around the world’, February 6, 2020. [Link](#)

41 J. C. Chaplin, ‘Safety Regulations – The First 100 Years’, Journal of Aeronautical History, May 1, 2011. [Link](#)

42 Smithsonian National Postal Museum, ‘The Suicide Club’ [Link](#)

43 Ibid.

44 International Air Transport Association, ‘IATA Annual Safety Report Executive Summary’, 2024. [Link](#)

of aviation should not be that the government can impose efficient safety regulations on a new and emerging technology. Rather, the lesson should be that tolerating risk in the early years of aviation did not prevent regulators from learning through experience what safety precautions were reasonable.

Early aviation innovators benefitted from aeroplanes being 'born free'. Innovators, and inventors working with 'born captive' technologies face significant regulatory hurdles that stifle innovation.

The Gig Economy

To see how these tensions can operate, let's look at what has come to be called the 'gig economy'. In 2011, Uber (then known as UberCab) launched its mobile app, providing San Francisco residents with the opportunity to hail luxury black cars. The next year, the company launched UberX, which allowed car owners to use the Uber app to offer rides. This style of car-hailing has come to be known as 'ridesharing', which allows people seeking car rides to hail a car via a mobile app.

While rideshare companies such as Uber, Lyft, and Bolt might be among the most notable gig economy companies, the gig economy sector is much more than ridesharing. The gig economy model, which allows ordinary people to use their assets to make some money, is seen in companies disrupting traditional hospitality, delivery, and freelancing and includes Airbnb, Deliveroo, Fiverr, and many more.

‘Gig economies weren't competitors to existing incumbents, but selling different products’

The gig economy model has proven popular across the world, but it has also upset traditional market incumbents such as taxi companies and hotels. Anti-gig economy protests have occurred all over the world thanks to the perception that gig economy companies are skirting regulations.

Yet although these companies were often portrayed as competitors to existing incumbents, these gig economy companies were in fact selling different products.

Taxis have been around almost as long as the automobile. The first self-propelled vehicles for hire in London were electric taxis designed by Walter Bersey, known as the 'Hummingbirds' due to the noise they made.⁴⁵ These early taxis, which often broke down and were sometimes slower than horse-drawn carriages, were licensed by Scotland Yard.⁴⁶ The iconic Austin FX3, which served as the template for today's black cabs, appeared on London's streets in 1948.⁴⁷

The economics of modern taxi transactions are relatively straightforward. Customers pay licensed taxi drivers for transport. The product taxi companies and drivers are offering is the ride.

45 Selina Hurley, 'The Surprisingly Old Story of London's First Ever Electric Taxi', Science Museum blog, July 9, 2012. [Link](#)

46 Ibid.

47 Nissan Europe Newsroom, 'The London Taxi: Background and History', August 6, 2012. [Link](#)

Hotels are much older than the combustion engine. While they perhaps emerged from a relatively regulation-free backdrop of Medieval inns, modern inns, hotels and B&Bs are subject to a host of regulations and requirements.

At first glance, it might seem as if Bolt is just another taxi company competing in the transportation market with traditional taxis and that Airbnb is competing with hotels. But this is not the case. Companies like Bolt allow drivers to use their own vehicles to transport customers in exchange for a fee. Likewise, Airbnb allows homeowners to offer a spare bedroom or property to paying travellers. This sort of exchange is not unheard of among friends or neighbours, but before the rise of the gig economy the transaction costs for such exchanges with a stranger were too high.

Before the new apps appeared on smartphones, it was technically possible for those who had just landed in a strange city's airport to approach the nearest public phone booth and begin calling local residents in the hope of finding someone willing to give them a ride and a spare bed. In reality such an approach would have been inefficient thanks to high transaction costs. Taxis and hotels provided an easy way for travellers to avoid such costs with ease.

‘Ridesharing firms are not selling rides and Airbnb is not selling short-term stays.⁴⁸ Rather they are selling reductions in transaction costs.’⁴⁹

In other words, as the economist Mike Munger has pointed out, ridesharing firms are not selling rides and Airbnb is not selling short-term stays.⁴⁸ Rather they are selling reductions in transaction costs.⁴⁹ This feature, as well as the fact that many gig economy workers work part-time, made regulating gig economy companies as if they were taxi companies or hotels inappropriate.

Nonetheless, campaigners persisted in objecting to the gig economy's business model. Legal challenges from Uber drivers resulted in a Supreme Court ruling in 2021 that its drivers were workers rather than contractors.⁵⁰ Likewise, a case examining whether drivers for Deliveroo were in fact employees of the firm made it all the way to the Supreme Court.⁵¹

The result has been the imposition of legal and regulatory constraints on these business models. But the resulting wins for the incumbent companies, have imposed wider losses – on companies drivers and passengers. Not least because having to treat drivers as workers comes with associated costs, which the companies involved pass on to drivers and passengers.

Around the world, ridesharing companies and other gig economy firms have faced legal and regulatory challenges. Airbnb hosts have faced restrictions in Italy, Austria, Malaysia, the United States, and the UK.⁵² Ridesharing companies have also faced bans and significant restrictions across the world.⁵³

48 Michael Munger, 'The Sharing Economy: Its Pitfalls and Promises', Institute of Economic Affairs, 2021. [Link](#)

49 Ibid.

50 Ryan Browne, 'Uber loses a major employment rights case as the UK's top court rules its drivers are workers', CNBC, February 19, 2021. [Link](#)

51 Constance Shaw and Matthew Ramsey, 'Deliveroo drivers not 'workers' says Supreme Court', Macfarlanes, December 12, 2023. [Link](#)

52 Angela Symons, 'Italy, Austria, Malaysia: Which cities and countries are cracking down on Airbnb-style rentals?', euronews.travel, June 11, 2023. [Link](#)

53 Madison Lennon, '14 Countries Where Uber Isn't Available', The Travel, Sept 28, 2023. [Link](#)

Drones

Some ‘born captive’ technologies are opposed by vested interests. But others find themselves caught in a tangle of laws and regulations, often despite the best efforts of many within government to clear a path for them.

Drones, for example, are the classic instance of a ‘born captive’ technology.⁵⁴ Unlike Bitcoin, aeroplanes and ridesharing, which launched free of established regulatory schemes to govern them, drones were born into a world full of aviation regulations. Despite the publication of all manner of guidance, consultations and regulations, it has still proved an enormous challenge to fit drones into this framework. Indeed, the state of drone regulation in England is so byzantine that some researchers have labelled it as ‘chaotic’.⁵⁵

Let’s start from first principles. It might initially seem appropriate for regulations governing aeroplanes and helicopters to cover drones. After all, drones share many of the characteristics of aeroplanes and helicopters: they fly over land, sea and people.

‘ Unlike Bitcoin, aeroplanes and ridesharing, which launched free of established regulatory schemes to govern them, drones were born into a world full of aviation regulations ’

Yet there are important differences. Drones do not carry people. They are generally lightweight. Drone flights are typically A→A rather than A→B. They also tend to fly at lower heights, and in different places. For aviation regulators, accounting for these differences while trying not to hamper innovation and ensure airspace safety has proved a significant challenge.

Let’s look at safety first. Over the last century, as outlined above, air flight has become far more safe. It is highly unlikely that the public would tolerate a rate of drone-related fatalities, accidents and injuries similar to the rate seen during the early years of flight.

As a result, safety has been the bedrock of most drone regulations around the world, including the UK’s. The UK was one of the first countries to pass Unmanned Aerial Vehicle (UAV) regulations in 2009.⁵⁶ These imposed rules (similar to those subsequently adopted by other governments) such as maximum flight altitudes, prohibitions on flying too close to people and airports, and requirements for operators to keep UAVs within visual line of sight.⁵⁷

Many of these safety measures are in response to real risks. Drones have collided with aeroplanes and been used by criminals in attempts to disable critical infrastructure.⁵⁸ Were someone to use a drone to successfully attack an aeroplane in flight, the result could be catastrophic. However, some of the regulations governing drones are not directly related to safety, in particular those relating to recreational drone usage.

54 Adam Thierer, ‘What 20 Years of Internet Law Teaches Us about Innovation Policy’, Federalist Society, May 12, 2016. [Link](#)

55 Scott McLachlan, Kudakwashe Dube, Burkhard Schafer, Anthony Gillespie, and Norman Fenton, ‘The Chaotic State of UK Drone Regulation’, arXiv, April 4, 2022. [Link](#)

56 Ibid.

57 Ibid.

58 Brian Barrett, ‘A Drone Tried to Disrupt the Power Grid. It Won’t be the Last’, Wired, Nov. 5, 2021. [Link](#)
Kevin Rawlinson, ‘Drone Hits Plane at Heathrow Airport, Says Pilot’, The Guardian, April 17, 2016. [Link](#)

The majority of recreational drone use occurs in public parks, beaches and other spaces regulated by local authorities.⁵⁹ Many of these have effective bans on drone flight or have policies in place that leave drone users with a disjointed and confusing set of regulations. Most English councils do not have a drone policy available to the public. But if a recreational drone user can uncover their local policy, there is a good chance that it will be hostile to their drone flight.

One study found that of the 77 English councils with publicly available drone policies, 73% banned recreational drone flights.⁶⁰ Researchers working on the same study were only able to confirm that recreational drone operators were allowed to fly drones in open or green spaces in 11% of the council jurisdictions they were able to review.⁶¹ In some cases, bans on drone flights resulted from local byelaws written in the 1950s aimed at regulating model aircraft powered by 'combustible substances'.⁶²

‘ Firefighters, farmers, building inspectors, search and rescue teams, construction workers, and many others have used drones to save lives and increase efficiency ’

Other jurisdictions use flawed analysis of CAA regulations to impose restrictions on drone flights.⁶³

Drones are best known as surveillance devices and as platforms for cameras, but they have valuable and in some cases life-saving capabilities beyond law enforcement and videography. Firefighters, farmers, building inspectors, search and rescue teams, construction workers, and many others have used drones to save lives and increase efficiency. During the COVID-19 pandemic, for example, a hospital on the Scottish mainland delivered medical supplies to a hospital on the island of Iona via drone.⁶⁴

Yet many in the industry still believe that regulations are grounding drones. A 2022 poll found that 46% agreed with the statement: 'There would be more drone use in my industry if the regulations were less restrictive.'⁶⁵ One noted that the courier and delivery industry would be particularly slow to begin thanks to regulatory constraints.⁶⁶

The same applies to those hoping to use drones in agriculture (for example to spread fertiliser), or to monitor and maintain offshore wind turbines. There are government agencies and departments, at both central and local level, that might reasonably expect such practices to come at least partly within their purview. The result, all too often, has been a regulatory logjam. One of the results of this logjam is that the public safety benefits of drones (e.g. drones used for policing, rail inspection, firefighting, etc) are evaluated by a regulator tasked with assessing only risk to airspace and not the potential benefits of drones.

59 Scott McLachlan, Kudakwashe Dube, Burkhard Schafer, Anthony Gillespie, Norman Fenton, 'The Chaotic State of UK Drone Regulation', arXiv, May 2022. [Link](#)

60 Ibid.

61 Ibid.

62 Ibid.

63 Richard Ryan, 'Who Wins: Drone Operators or Local Government?', Jurocity, August 31, 2019. [Link](#)

64 The Regulatory Horizons Council, 'The Regulation of Drones: An exploratory study' November 2021. [Link](#)

65 PWC, 'Building Trust in Commercial Drones' [Link](#)

66 Ibid.

Autonomous vehicles

Autonomous vehicles (AVs) have been a feature of the science fiction genre for decades. More recently, headline writers, tech optimists, inventors and many others have insisted that their real-world deployment is just around the corner. And yet, autonomous cars and lorries are not ubiquitous anywhere in the world. Even now, only a handful of governments have authorised their testing or usage.

If autonomous vehicles were an ordinary part of day-to-day life, they would yield significant environmental, economic and safety benefits.

‘ The average car spends most of its life sitting in a parking space – often, in major cities, taking up hugely valuable real estate ’

First, safety. Many of the negative effects of driving are products of human error. Traffic lights exist because human senses cannot safely account for a car’s surroundings adequately enough to avoid collisions at intersections. According to the American National Highway Safety Administration, in more than 90% of car crashes a decision made by the driver was the last event before the crash.⁶⁷

This should all be fairly self-evident. Even the best-performing human eyes only process a narrow slice of the electromagnetic spectrum. Human hearing is also limited.⁶⁸ Sleep deprivation, distraction and the influence of alcohol and other drugs can hamper our ability to respond to what our limited eyes and ears are processing. Self-driving cars offer the opportunity to remove the driver from most vehicle operations such as braking, steering and indicating.

Autonomous driving technology can save money as well as lives. The average car spends most of its life sitting in a parking space – often, in major cities, taking up hugely valuable real estate. Even when it is on the road, huge amounts of time are often wasted in traffic jams and waiting at red lights. According to the traffic monitoring firm Inrix, British drivers lost an average of 80 hours a year thanks to traffic congestion.⁶⁹ London drivers, who have to navigate one of the most congested cities in the world, feel the costs particularly acutely, spending an average of 156 hours a year in traffic.⁷⁰ Last year, the average London driver lost £1,377 worth of time due to congestion and the average British commuter £707.⁷¹

Autonomous vehicles have the potential to significantly reduce congestion. According to researchers from Carnegie Mellon University, 22% of vehicles on a motorway being AVs travelling in platoons could increase vehicle throughput by 30%.⁷² If 100% of vehicles on

67 ‘A weighted sample of 5,470 crashes was investigated over a period of two and a half years, which represents an estimated 2,189,000 crashes nationwide. About 4,031,000 vehicles, 3,945,000 drivers, and 1,982,000 passengers were estimated to have been involved in these crashes. The critical reason, which is the last event in the crash causal chain, was assigned to the driver in 94 percent (+/- 2.2%)’. National Highway Traffic Safety Administration, ‘Critical Reasons for Crashes Investigated in the National Motor Vehicle Crash Causation Survey’, February 2015. [Link](#)

68 James Pocock, ‘How do human hearing thresholds compare to those of other animals?’, Hidden Hearing, January 11, 2023. [Link](#)

69 ‘INRIX 2022 Global Traffic Scorecard: London Tops List as Most Congested City, U.S. Cities Inch Closer’, INRIX, January 10, 2023. [Link](#)

70 Ibid.

71 Ibid.

72 Neda Mirzaeian, Soo-Haeng Cho, Alan Scheller-Wolf, ‘A Queueing Model and Analysis for Autonomous Vehicles on Highways’, Management Sciences, October 5, 2020. [Link](#)

motorways were AVs, throughput could increase by more than 400%.⁷³ Other studies have also found that AVs are likely to improve traffic flow.⁷⁴

There are admittedly concerns that AVs may increase traffic and congestion. According to a Department for Transport report, they could increase the number of vehicles on the roads, by allowing for more mobility among the elderly and those without driving licences (and presumably moving people off public transport).⁷⁵ But the same report also claimed that AVs would also make sitting in traffic less stressful, allowing passengers to work, read, watch TV and even sleep while travelling.⁷⁶

Moreover, as AVs become more widespread, car ownership should decrease, as ridesharing apps become a more feasible option. Most people who own cars do not want a car for the sake of having a car; they want a means to get from one place to another. It is reasonable to believe that in a world where AV technology is safe and integrated with ridesharing apps, fewer people will choose to buy cars. That would not only save people large amounts of money, but free up huge amounts of land for housing or other purposes.

‘The Government does allow for AV manufacturers and researchers to conduct limited technology tests. But it has failed to implement many of the measures it committed to’

Given the economic, environmental and life-saving potential of driverless cars, the lack of widespread use may be puzzling. But there are a number of barriers to AVs becoming ubiquitous.

Although driverless cars have been successfully trialled in a number of countries, it is notable how often such trials take place in dry environments such as the US state of Arizona.⁷⁷ Rain, snow, frost and ice continue to pose challenges, although advances in sensor technology are improving to overcome these challenges.⁷⁸ The UK, for example, is one of the wetter countries in Europe.⁷⁹ As such, it is not the best environment for widespread use of current autonomous vehicle technology.

However, the weather is not the only barrier facing those who would like to see driverless cars across the UK. The Government does allow for AV manufacturers and researchers to conduct limited technology tests.⁸⁰ But it has failed to implement many of the measures it committed to.

In 2017, Philip Hammond announced that the UK would have fully driverless cars by 2021. In the Autumn Budget, the then Chancellor pledged that the Government would create

73 Ibid.

74 Yang Zheng, Member, Jiawei Wang, and Keqiang Li, ‘Smoothing Traffic Flow via Control of Autonomous Vehicles’, arXiv, December 22, 2018. [Link](#)

75 ‘New Government report states that driverless cars could increase congestion by 85%’, Royal Automobile Club, January 16, 2023. [Link](#)

76 Ibid.

77 ‘From Sunshine to Snow: Self-Driving Car Manufacturers Face the Tough Weather Challenge’, PR Newswire, August 8, 2018. [Link](#)

78 Sanksshep Mahendra, ‘Can Self-Driving Cars See in Bad Weather?’, Artificial Intelligence +, June 14, 2023. [Link](#). Bryson Stanley, ‘Autonomous Vehicle Engineers Need to Solve the Weather Problem’, Medium, October 17, 2023. [Link](#)

79 ‘Average precipitation in depth (mm per year) - Country Ranking’, Food and Agriculture Organization of the United Nations, 2017. [Link](#)

80 Department for Transport, Centre for Connected and Autonomous Vehicles, Department for Science, Innovation and Technology, and Department for Business, Energy & Industrial Strategy, ‘Guidance Trialling automated vehicle technologies in public’, February 6, 2019. [Link](#). Tom Seymour ‘UK autonomous vehicle trial demonstrates safe transfer of driving modes’, Fleet News, March 29, 2022. [Link](#)

'the most advanced regulatory framework for driverless cars in the world' and stated that it wanted 'to see fully self-driving cars, without a human operator, on UK roads by 2021'.⁸¹ That year came and went without an advanced regulatory framework in place and without driverless cars on the road. The current government's plan is to have an autonomous vehicle safety framework in place in 2025.⁸²

The delay in manufacturers testing autonomous vehicles in the UK is in part thanks to a lack of clear safety regulations. Between 2018 and 2020, the Law Commission published three consultation reports on a range of issues affecting autonomous vehicle deployment. In 2022, the commission published 75 recommendations making up a new autonomous vehicle regulatory framework.⁸³

At present, the Government's plan is to have a regulatory scheme in place for autonomous vehicles to be allowed on the roads by 2026. That the Automated Vehicles Act became law this year is reassuring, but it is notable that if autonomous vehicles are driving on British roads in 2026 that achievement will be the result of a five-year delay to a commitment made seven years ago.⁸⁴

‘ The delay in manufacturers testing autonomous vehicles in the UK is in part thanks to a lack of clear safety regulations ’

Lab-grown meat⁸⁵

Raising animals for food consumption poses significant moral and economic challenges. Although British agricultural greenhouse gas (GHG) emissions are lower than they were in 1990, the agricultural sector continues to produce around 10% of the UK's GHG emissions, with a significant portion coming from methane produced by livestock.⁸⁶

In addition to the agricultural sector's GHG emissions, an increasing number of people find eating animal meat morally objectionable.⁸⁷ Lab-grown meat offers a potential way to address the environmental and ethical worries associated with consuming meat obtained via the killing of animals.

It has long been possible for vegetarians and vegans to eat products such as burgers and sausages that are made to look like meat but are usually made of plants or fungi. Recent plant-based burgers and sausages are targeting flexitarians, mimicking their animal counterparts in taste and culinary experience. In contrast, lab-grown meat is not a substitute. Rather, it is meat grown from animal cells. Such meat removes the moral concerns associated with animal suffering.

81 HM Treasury, 'Autumn Budget 2017', November 22, 2017. [Link](#)

82 Department for Transport and Department for Business and Trade, 'Connected & Automated Mobility 2025: Realising the benefits of self-driving vehicles in the UK', August 2022. [Link](#)

83 Law Commission, 'Automated Vehicles: Joint Report', January 25, 2022. [Link](#)

84 Department for Transport, Centre for Connected and Autonomous Vehicles and The Rt Hon Mark Harper MP, 'Self-driving vehicles set to be on roads by 2026 as Automated Vehicles Act becomes law', [Gov.uk](#), May 20, 2024. [Link](#)

85 Former CPS researcher Eamonn Ives provided much of the research and writing included in this section.

86 Department for Environment Food & Rural Affairs, 'Agri-climate report 2022', October 27, 2022. [Link](#)
Department for Business, Energy & Industrial Strategy, '2021 UK Greenhouse Gas Emissions, Final Figures', February 7, 2023. [Link](#)

87 Rachel Moss, 'Number of Vegans in Britain Soars in Past Decade, Here's Why', Huffington Post, March 7, 2017. [Link](#)

Lab-grown meat is also better for the environment. One independent analysis of lab-grown meat found that it requires between 7% and 45% less energy, 99% less land area, and 82%-96% less water than raising animals while creating 78%-96% fewer greenhouse gas emissions.⁸⁸

These benefits, when combined with the ethical implications, make lab-grown meat look like a product that would be popular with consumers. However, producers have found getting lab-grown meat to market in the UK difficult. Two categories of regulation have erected barriers to lab-grown food: 1) novel food regulations and 2) food labelling requirements.

Before Brexit, the UK was bound by the 'Novel Food legislation' (Regulation EC No. 2015/2283). The rules which make up this legislation were rolled over into British law after Brexit. One of the main pillars of the Novel Food legislation was that products, ingredients or production processes that were not widely adopted by people in EU member states before May 1997 would be classified as 'novel foods' and would be subject to certain regulations.

‘One independent analysis of lab-grown meat found that it requires between 7% and 45% less energy, 99% less land area, and 82%-96% less water than raising animals while creating 78%-96% fewer greenhouse gas emissions’

Novel foods need to be authorised prior to being placed on the market: examples of products which have passed the authorisation include chia seeds, phytosterols (used in cholesterol-reducing margarines, for instance), and products containing cannabidiol (CBD) extracts.

A charitable interpretation of the Novel Food legislation is that it exists to ensure that any food sold in the UK is safe to consume. However, this is an extremely cumbersome process. For example, according to the Food Standards Agency (FSA) itself, applications will 'in most cases [...] take at least a year'. This lengthy process hinders companies working at the forefront of developing innovative products, especially in an industry characterised by making small tweaks to test products on a continual basis as learning emerges over time.

Second, there still exists a large uncertainty around whether or not a product has a reasonable chance of gaining approval. While there is guidance about what to include in applications, there is as yet no specific information pertaining to clean meat. Where there is clarity, it is usually with regards to rules which appear questionable. One of the principles underpinning the Novel Food legislation, for example, is that a novel food intended to replace existing products 'must not differ in a way that the consumption of the Novel Food would be nutritionally disadvantageous for the consumer'.

It is hard to predict how this might be interpreted, especially given the broad heterogeneity that exists currently within the same types of foodstuffs. It is also up for debate whether this really ought to be an objective which the FSA should be pursuing – provided that a foodstuff will not cause harm, does it matter whether it fulfils specific nutritional requirements? Indeed, if this rule was applied retroactively to all foodstuffs on sale in the UK, how many would fall foul of it?

Third, the Novel Food legislation asks too much of clean meat producers. Maarten Bosch, the CEO of Mosa Meat – a company spun out of the work on clean meat originally led

⁸⁸ Hanna L. Tuomisto and M. Joost Teixeira de Mattos, 'Environmental Impacts of Cultured Meat Production', *Environmental Science & Technology*, June 17, 2011. [Link](#)

by Professor Mark Post – has said in the past that lab testing of novel foods requires 10 kilograms of product to be analysed. This might be a minimal burden for a novel food which can be produced in such quantities cheaply. But that is not the case for clean meat, which is much more expensive than other novel foods on a gram-for-gram basis.

In order to scale production to that size, a company would need to invest heavily, which is understandably risky in the absence of assurances that its product is likely to receive regulatory approval within a reasonable timeframe.

There is little reason why Britain should continue to precisely follow the Novel Food legislation now that it has left the EU. Small, pragmatic tweaks to the rules could allow the clean meat industry to flourish without compromising on consumer safety.

Part Two: Regulating the Future

In the first part, we showed some of the problems and tensions that have arisen as innovation has collided with regulation – and in particular the way in which ‘born captive’ technologies often have a much tougher time than those that are ‘born free’.

In this second section, we will set out how the Government can craft a better approach to the regulation of new and emerging technologies. Such an approach should embrace ‘permissionless innovation’, reject the precautionary principle, and ask firms to seek forgiveness rather than permission. This approach will establish the UK as one of the globe’s most innovative, dynamic, entrepreneurial and technologically advanced countries, while preserving vital safety standards.

‘ The Government should mandate that each regulatory body craft a binding policy charter that outlines a commitment to permissionless innovation ’

One of the most important steps we can take to encourage innovation is to make it clear to researchers, entrepreneurs and investors that those working on new and emerging technologies will be asked to seek forgiveness from the government rather than permission. This approach is perhaps best presented by Adam Thierer in his book ‘Permissionless Innovation’.⁸⁹ Thierer contrasts permissionless innovation with the precautionary principle, which he defines as ‘the belief that new innovations should be curtailed or disallowed until their developers can demonstrate that they will not cause any harms to individuals, groups, specific entities, cultural norms, or various existing laws, or traditions’.⁹⁰

In the first edition of *Permissionless Innovation* Thierer outlines 10 principles that ought to guide lawmakers and regulators. The first is to ‘Articulate and defend permissionless innovation as the general policy default.’

The emphasis on articulation is appropriate, as investors and entrepreneurs need more than mere pro-innovation rhetoric for reassurance. Accordingly, the government should mandate that each regulatory body craft a binding policy charter that outlines a commitment to permissionless innovation.

As Thierer points out, these kinds of documents have been written before, not least the Clinton administration’s 1997 ‘Framework for Global Electronic Commerce’.⁹¹ This document included a commitment to (among other things) ‘avoid undue restrictions on electronic commerce’, and greatly helped spur the growth of the internet.⁹²

89 Adam Thierer, ‘Permissionless Innovation: The Continuing Case for Comprehensive Technological Freedom’, Mercatus Center, March 15, 2016. [Link](#)

90 Ibid.

91 Ibid.

92 Ibid.

The role of policy charters

The goal of a regulatory framework governing new and emerging technologies should be to facilitate innovation and economic growth while preventing significant and likely harms. Such an approach will require significant changes to the current regulatory state, which too often acts as a barrier to economic growth and adopts a view of risk and harm that is too cautious and precautionary.

A cornerstone of this new regulatory framework should be policy charters that clearly establish a set of safety standards imposed on regulated products and practices, as well as an outline of the likely and significant harms that such standards are intended to prevent. These documents will provide regulatory certainty for entrepreneurs, investors and inventors who will be in the position of being free to innovate and experiment so long as they remain within narrow guardrails.

‘The current regulatory state too often adopts a view of risk and harm that is too cautious and precautionary’

Harms

Before outlining safety standards, each regulatory agency should outline what likely and significant harms it aims to prevent.

Likely Harms

The use of the term ‘likely’ is one that invites subjective judgement. Risk tolerances vary. Some people would rather drive a car from London to Edinburgh than take an aeroplane. Some people would happily pay £100 to go skydiving, while others could not be paid £1,000 to skydive.

Lawmakers and regulators are in the unenviable position of judging what tolerance of risk is appropriate for the general public. And it is important to remember that we do tolerate many risks, including risks of death and serious injury. For example, thousands of people are killed or injured in traffic accidents on British roads every year. Parliament could minimise these risks by passing a law capping the driving speed limit at 5mph. Such a measure would save lives but would also impose significant economic costs. Lawmakers and regulators have correctly treated a small number of road accidents as a tolerable cost to incur for the benefits of swift vehicle travel, even if they continuously try to make that number smaller still.

Despite the inherent difficulties involved in measuring tolerance for risk for the public, there is precedent for regulatory agencies stating what an intolerable risk is. In 2021, for example, the Civil Aviation Authority (CAA) explained that those applying for launch operator licences, return operator licences, or spaceport licences would have to demonstrate that they had taken steps to ensure that the health and safety risks associated with their planned activities were ‘as low as reasonably practicable’ (‘ALARP’).⁹³ The CAA noted that an unacceptable level of societal risk was a risk higher than 1×10^{-4} of one or more casualties/fatalities per mission (i.e. the equivalent of 1 accident per 10,000 missions).⁹⁴

93 Civil Aviation Authority, ‘CAP2220: ALARP acceptability policy’, July 29, 2021. [Link](#)

94 Ibid.

ALARP is not a new or rare heuristic. It was first codified in the Health and Safety at Work etc. Act 1974, and since then, regulatory agencies and private sector industry groups and businesses have used it for safety guidance and risk management.⁹⁵

Regulatory agencies around the world also use the 'Value of a Statistical Life' (VSL) to gauge how much extra income a worker would have to enjoy to tolerate increased risk. This is used to calculate how much it would cost to reduce the risk of death in order to save one life.⁹⁶ The NHS operates on a similar principle, when deciding which medicines and treatments to fund, via a metric called the 'Quality Adjusted Life Year' (QALY), which measures how long a treatment will help the patient live for and the level of health they will enjoy during that time. Interventions that deliver an extra year of good health for less than £20,000 are generally considered to be cost-effective and therefore approved.⁹⁷

Because regulatory agencies cover almost every feature of British commercial life, it would be inappropriate for each agency to arrive at the same calculation of a tolerable risk of significant harm⁹⁸

In terms of VSL, we can take the following hypothetical example provided by the American Environmental Protection Agency:

'Suppose each person in a sample of 100,000 people were asked how much he or she would be willing to pay for a reduction in their individual risk of dying of 1 in 100,000, or 0.001%, over the next year. Since this reduction in risk would mean that we would expect one fewer death among the sample of 100,000 people over the next year on average, this is sometimes described as 'one statistical life saved'. Now suppose that the average response to this hypothetical question was \$100. Then the total dollar amount that the group would be willing to pay to save one statistical life in a year would be \$100 per person x 100,000 people, or \$10 million. This is what is meant by the 'value of a statistical life.' Importantly, this is not an estimate of how much money any single individual or group would be willing to pay to prevent the certain death of any particular person.'⁹⁸

Because regulatory agencies cover almost every feature of British commercial life, it would be inappropriate for each agency to arrive at the same calculation of a tolerable risk of significant harm. Nonetheless, each agency can provide calculations explaining what they consider the likelihood of a significant harm that would justify intervention from the agency.

Such an approach would be good for businesses, which would have access to a clear list of harms they would have to avoid. But it would also be good for policymakers, who would be providing the private sector with more regulatory transparency and accountability.

The development of unmanned aerial vehicles (UAVs) provides an example of how an agency could consider likely harms. UK UAV operators must currently fly their drones within visual line of sight. This requirement limits how far UAV operators can fly their devices. Under the regulatory regimes outlined in this paper, the CAA would only be able to halt the

95 'The Application of ALARP to Radiological Risk, A Nuclear Industry Good Practice Guide', Industry Radiological Protection Co-ordination Group (IRPCG), 2012. [Link](#)
Centers for Disease Control and Prevention, 'ALARA – As Low As Reasonably Achievable', Page last reviewed: May 17, 2022. [Link](#)

96 Andersson, H. and N. Treich: 2011, Handbook in Transport Economics, Chapt. 'The Value of a Statistical Life', pp. 396-424, in de Palma, A., R. Lindsey, E. Quinet and R. Vickerman (eds.) Edward Elgar, Cheltenham, UK. [Link](#)

97 NICE, Chapter 7 of 'NICE Process and Methods' titled 'Assessing cost effectiveness', November 30, 2012. [Link](#)

98 Environmental Protection Agency, 'Mortality Risk Valuation', last updated March 11, 2024. [Link](#)

flight of a UAV beyond visual line of sight if the flight raised the risk of a likely significant harm. It might still do so – but it would have to show that there were specific dangers.

Significant Harms

Policy charters should also note what significant harms the regulatory agency aims to prevent. Death and serious injury are the most obvious, but many regulatory agencies will have to consider significant harms specifically related to the products and practices within their remit. Generally speaking, harms included in this category include only those that would result in:

- serious injury or death
- facilitation of serious crimes
- permanent serious damage to the environment, critical infrastructure or national security

Again, these would differ by regulator. For example, the CAA would have a list of significant harms that do not apply to Ofsted. The CAA policy guidance would list in-flight collisions, runway obstruction and loss of aircraft control as being among the significant harms its safety standards were intended to prevent. The Office for Nuclear Regulation would include nuclear meltdown, nuclear waste spills, and excessive radiation levels. Agencies such as the FCA and Ofcom, which are not typically considered in discussions of significant harms such as death or broken limbs, would still have specific significant harms to list. Ofcom might list the unauthorised interception and disclosure of communications sent via wireless telegraphy, the risks of child sexual exploitation and illegal speech.⁹⁹ The FCA would include money laundering and other financial crimes in its list of significant harms.

‘ The history of technology reveals a wide range of harms that critics and sceptics have cited to hamper the use of new and emerging technologies ’

The need for tight definitions

It is always easy to think of hypothetical dangers from innovation. Indeed, the history of technology reveals a wide range of harms that critics and sceptics have cited to hamper the use of new and emerging technologies. These include disruptions to market incumbents, which may lose business after a new technology appears on the scene. They also include alleged negative effects on social cohesion and social functions. Books like ‘The Victorian Internet’ by Tom Standage, or indeed my colleague Robert Colvile’s ‘The Great Acceleration’, trace the remarkably familiar moral and economic panics that new technologies have provoked, from the telegraph to the bicycle to the postcard.¹⁰⁰

It is inevitable that regulators will face pressure to protect market incumbents and to respond to worries about how new technologies are affecting society. But history provides numerous examples of these worries being either unfounded or damaging to innovation and entrepreneurship.

Consider the case of ridesharing, which we looked at above. In many jurisdictions, taxis are tightly regulated, governed by a myriad of obligations associated with insurance, fares, pick-up/delivery locations, and the number of taxis allowed on the roads. When

99 Wireless Telegraphy Act 2006. [Link](#)

100 Tom Standage, ‘The Victorian Internet: The Remarkable Story of the Telegraph and the Nineteenth Century’s On-Line Pioneers’, Walker & Company, September 1998.
Robert Colvile, ‘The Great Acceleration’, Bloomsbury, April 7, 2016.

ridesharing firms appeared, taxis faced loss of revenue from relatively unregulated competitors.

The harms incurred by taxis hurt those invested in the taxi industry, but it is hard to argue that those harms were outweighed by the opportunities, advantages and convenience the new technology provided.

Even when incumbents are threatened by innovation, there is nothing to stop the Government from helping those working in incumbent industries, whether in the form of welfare payments, support with retraining and skills, or even in the case of the taxi sector by buy-backs of fees and licences. Indeed, the biggest fear about technology has always been that it will automate jobs out of existence – yet we have always created more jobs and better jobs with each wave of innovation, often in fields that could not have been imagined previously.

**‘ No new technology is without costs,
but political and social institutions have
proven to be robust in the face of them ’**

Even if new and emerging technologies did not harm market incumbents, there would inevitably be concerns about the effects on society. For example, in recent years lawmakers, activists, academics and policy experts have raised concerns about the effects of social media. Worries range from addiction, the spread of misinformation, harassment, bullying to the shortening of people’s attention spans. (It is worth noting, as mentioned above, that very similar complaints were made about all manner of previous technologies.)

No new technology is without costs, but political and social institutions have proven to be robust in the face of them. Seatbelts, automatic braking, airbags, indicator lights, rearview cameras, and other safety-enhancing improvements were all developed well after automobiles were available to the public.

Likewise, social media is in the news often in large part because of concerns over how prominent companies such as Meta, X (formerly Twitter), and Google treat user content. In the UK, worries over abusive content and material that promotes suicide and self-harm have resulted in proposals such as the Online Safety Act, which empowers Ofcom to craft and enforce guidelines for how online firms treat user-generated content. Yet under the current approach, Ofcom is required to police the internet for content that does not pose a risk to life, limb, national security or essential infrastructure.

Among many examples of such content are depictions of realistic violence to fictional animals, abusive content that targets a religion, and bullying content. Restricting the scope of regulation to significant and likely harms provides a much more manageable, and much better defined, set of problems to deal with – and ensures that regulators really can focus on those core problems, rather than finding themselves trying to police the whole internet, with knock-on implications on the attractiveness of the UK as a place to host tech companies. (One of the many issues highlighted by the CPS in its work on this topic is the way in which the definitions of companies were so wide as to capture not just the tech giants, but all manner of other websites which could not afford the enormously expensive apparatus of regulation that the law would require.)

Setting standards or screening products?

Earlier, we argued that a growth-friendly regulatory model is one in which companies are free to innovate within specific guidelines, rather than proving the safety of every product under the precautionary principle. This philosophical difference is reflected in two different models of regulation: whether the regulator sees its job as setting standards, or approving products on a case-by-case basis.

The American lawyer Peter Huber describes regulatory agencies that embrace the standard-setting model as ‘exorcists’ and those that screen new products and services as ‘gatekeepers’.¹⁰¹ Exorcists cast out the known demons, and the gatekeepers protect us from unknown harms.

Of course, the distinctions are not cut and dried. Agencies that regulate known and familiar products and services such as automobiles and aeroplanes set safety standards for manufacturers, researchers and entrepreneurs to follow.

But in general, the argument of this paper is that we should where possible encourage all gatekeepers to retrain as exorcists.

One of the challenges of imposing a standard-setting regulatory framework for new and emerging technologies is that often the harms associated with the technology are not fully understood. Although technology policy experts, entrepreneurs and others can make well-informed guesses about potential harms, we must accept that no one will ever be able to make a full account before a product reaches market. Indeed, many safety measures that we now consider obvious evolved gradually over a period of trial and error. The first cars did not have seat belts. Fatal accidents appear often in the early history of aviation.¹⁰²

But at the same time, ensuring that every product must be inspected and approved and signed off before deployment imposes huge costs and crippling delays to innovation, especially where it is the result of an iterative process. And if anything, we are increasing rather than decreasing the number of gatekeepers: as mentioned above, services such as Google Maps or Amazon Prime would today could well fall foul of such a regime.

Despite the potential harms of new and emerging technologies being unknown, regulatory agencies can nonetheless commit to outlining what significant and likely harms would justify intervention. For example, Bitcoin emerged as a ‘born free’ technology. Under the regulatory scheme outlined in this paper, the Financial Conduct Authority (FCA) or another government agency would only be able to prohibit the sale, mining and trading of Bitcoin if it could identify how such sale, mining and trading posed either a risk of serious injury or death; money laundering or funding of terrorism; permanent serious damage to the environment or critical infrastructure; or a grave threat to financial stability. That would not prevent the FCA also issuing and insisting on standards associated with KYC, AML, and Counter-terrorist financing (CTF) obligations. But it would not be in a position to veto the deployment of the technology without good cause.

With ‘born captive’ technologies, the regulatory environment tends to be more complex – but the potential harms are usually easier to codify and understand. Drones are not aeroplanes, but they pose some of the same potential harms. Similarly, although driverless car technology is relatively new, it raises many of the same concerns raised by human-operated cars, such as risk of collision with other vehicles, buildings, animals and people.

101 Peter Huber, ‘Exorcists vs. Gatekeepers in Risk Regulation’, Regulation magazine Vol. 7 No. 6, 1983. [Link](#)

102 ‘The Suicide Club’ [Link](#)

Making Britain a leader in tech regulation

Making the changes outlined in this paper would be difficult, requiring structural and legislative changes as well as a cultural shift among dozens of agencies and their thousands of staff. Such changes will take years to achieve.

Nonetheless, adopting the following policies would help ensure that the Government can begin implementing changes that would yield welcome results.

‘The Government should establish an office with a designated minister to oversee regulatory reform’

Regulatory Oversight Office

The Government should establish an office with a designated minister to oversee regulatory reform. The CPS argued in its recent paper ‘The Future of Regulation’ that this minister should have the authority to exercise veto power over new regulatory initiatives across Whitehall, in the same way as the Chancellor does with spending decisions.¹⁰³ Such a minister would be an ideal person to oversee changes to the regulatory state.

The minister would be responsible for four main objectives:

- 1) A comprehensive review of existing regulation. Such a review would include a cost analysis as well as recommendations on which existing regulations are worth repealing, keeping, or amending. This review would follow consultation with a range of businesses to help the government identify the most costly and burdensome regulations. As we pointed out previously, it is a scandal that only one department – Defra – has a full audit of all the regulations it has imposed.
- 2) Oversee the writing of policy charters. Each regulatory agency would be tasked to complete a clear and concise policy charter outlining the safety standards and the significant harms as described above.
- 3) Identify the mostly costly retained EU law and prioritise it for swift repeal or amendment, as well as introducing a wider programme of regulatory sunseting and post-introduction monitoring, with the assistance of a new, independent Regulatory Audit Office.
- 4) Adjudicating jurisdiction disputes that emerge between regulators seeking authority to regulate a new or emerging technology.

Regulatory Sunseting

This paper has highlighted instances where emerging technologies can outpace regulation and legislation. The result is unfortunately that innovation is often stalled while entrepreneurs wait for clear regulatory guidance or permission.

The history of regulation should motivate lawmakers who prioritise growth and innovation to consider how best to tackle the pacing problem of technology overtaking law and regulation.

One approach would be to institute a ‘one in two out’ or ‘one in one out’ regulatory system whereby every new regulation requires the repeal of one or two other regulations. Yet

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although such proposals may sound appealing to supporters of a smaller regulatory state, they approaches would not necessarily result in a less burdensome regulatory environment.

Regulations are not all created equal, and in some cases removal of regulation would prompt expensive compliance costs for firms put in a position to readjust quickly to repeals of regulation. Indeed, the CPS's examination of regulatory impact assessments across the 2010s found that there were a small number of very expensive regulations, and many more that were (theoretically) of negligible cost. It also found, sadly, that many of government's activities – including anything controlled by the Treasury – were exempted from the regulatory budgeting system. We also need to consider the ways in which multiple regulations often interact and accrete.

‘ The history of regulation should motivate lawmakers who prioritise growth and innovation to consider how best to tackle the pacing problem of technology overtaking law and regulation ’

The CPS paper did make several proposals for improving the regulatory budgeting process. But it also recommended that regulators should be obliged to revisit regulations on a regular basis. This is particularly important in the tech sector, due to how fast things can move. We therefore propose that:

- 1) Every new regulation should be accompanied by a sunset date for the regulation. The sunset date should include a justification for the date, as well as independent estimates of the expected costs and benefits of that regulation.
- 2) Existing regulations should undergo regular review (we suggested after periods of five and 10 years). There should always be a positive ministerial decision made to keep a regulation in place. Decisions to scrap regulations should include the reasoning behind the choice.

Recent experience provides stark examples of how difficult this kind of regulatory reform and repeal can be. The Retained EU Law (Revocation and Reform) Bill, which began its journey in the Commons in the Autumn of 2022, would have sunsetted all retained European Union regulations on December 31, 2023.¹⁰⁴ However, the Bill faced a number of obstacles, one of the most notable being that there was no comprehensive list of retained EU law (REUL).

Estimates of the number of retained EU laws and regulations vary, but the Government's estimate of almost 6,757 on its REUL dashboard is likely an underestimate.¹⁰⁵ Our previous paper identified 5,199 EU regulations that were translated directly into UK law in the years 2010-19 alone, alongside 196 directives (which often involved sweeping changes to UK rules).

Sandboxing

One of the most notable regulatory advances made by the Government in recent years has been to establish sandboxes, which are jurisdictions exempt from specific regulations in which firms can experiment.

104 Retained EU Law (Revocation and Reform) Act 2023. [Link](#)

105 Department for Business and Trade, "Research and analysis Retained EU law dashboard", published 22 June 2022 and last updated 22 January 2024. [Link](#)

The UK has a strong track record of setting up sandboxes. In 2016, the FCA became the first financial regulatory agency to establish a financial technology sandbox.¹⁰⁶ Since then, British departments and regulatory agencies such as the Department of Transport and the Information Commissioner's Office have created sandboxes. Dozens of governments across the world have followed suit.¹⁰⁷

Sandboxes vary in purpose and structure, but they all seek to allow for selected organisations to operate outside usual regulatory restrictions. Motivations for sandboxes vary. Some agencies and governments hope sandboxes will encourage investment and result in tax proceeds, while others embrace sandboxes as a means to encourage innovation.¹⁰⁸ These motivations need not be mutually exclusive, but there are special considerations for sandboxes built with increased innovation in mind.

‘In many ways, the proposals in this paper would take the sandbox model and apply it across the economy’

The FCA's sandbox is one such example, claiming that it allows firms ‘to test innovative propositions in the market with real consumers’.¹⁰⁹ But robust competition is a necessary condition for innovation. Without the right policies in place, sandboxes risk undermining competition by allowing a handful of well-connected firms to enjoy the benefits of what is effectively government-sanctioned permission to skirt rules.

In many ways, the proposals in this paper would take the sandbox model and apply it across the economy. Even if not, however, we should be encouraging much greater use of them.

That said, we do need to adopt best practice in doing so. One way to ensure that sandboxes do not stifle innovation or enrich market incumbents is to adopt one or a combination of the four methods outlined by Brian Knight and Trace Mitchell in their paper on sandboxes and innovation: 1) lowering restrictions for firm entry, 2) allowing firms to enter a sandbox if a comparable firm has already been approved, 3) making an objective standard of consumer protection a requirement for sandbox entry, or 4) allowing industry groups, trade associations, and other groups related to a particular industry to facilitate sandbox entry on behalf of their members.¹¹⁰

There are arguments for and against each approach. However, the third option with its emphasis on safety would allow for regulatory agencies to outline clear safety standards similar to those outlined above and would prevent collusion between trade groups and the emergence of novel products from barring worthwhile firms from participating in the sandbox.

106 Knight, Brian and Mitchell, Trace, ‘The Sandbox Paradox: Balancing the Need to Facilitate Innovation with the Risk of Regulatory Privilege’, March 26, 2020. South Carolina Law Review 445, 2020, Mercatus Research Paper, 2020, C. Boyden Gray Center for the Study of the Administrative State Research Paper No. 19-36, [Link](#)

107 The World Bank, ‘Key Data from Regulatory Sandboxes across the Globe’, November 1, 2020. [Link](#)

108 Hilary J. Allen, ‘Regulatory Sandboxes’, The George Washington Law Review Vol. 87 No. 3, May 2019. [Link](#)

109 FCA Innovation Hub, ‘Regulatory Sandbox’, March 27, 2022. [Link](#)

110 Knight and Mitchell

Conclusion

The UK suffers, and has suffered, from a relative lack of innovation. But there is no reason why we could not become a leader once again. As noted above, the UK has strong comparative advantages. But assuming such a leadership role requires significant regulatory change – and in particular a shift away from the precautionary principle and an embrace of innovation, commerce and investment.

Such a change need not require adoption of ideological libertarianism, or a rash dismissal of all regulation. It takes a proportionate, judicious approach to regulation – one in which the rules of the game are clear to all players well in advance.

**‘ The UK has strong comparative advantages.
But assuming such a leadership role requires significant
regulatory change – and in particular a shift away
from the precautionary principle and an embrace
of innovation, commerce and investment ’**

There is a world where the UK becomes a global centre for technological experimentation, research and innovation. Where entrepreneurs and inventors are free to test new products and launch innovative companies. It is a world where airships the size of skyscrapers join drones and flying cars in the sky, British children enjoy one-on-one AI-driven tutoring at home, cities are stuffed with smart technology, new fintech firms are blossoming, the state is more productive, and people around the world reap the rewards of life-saving treatments and vaccines built and designed in the UK.

Unfortunately, this is not the world current policy will produce.

It is especially crucial for the Government to get technology regulation correct because success in the 21st century will be largely dependent on the speedy and successful adoption of new and emerging technologies. A country that does not have a regulatory structure nimble and flexible enough to respond to AI advances and synthetic drugs as well as developments in nuclear energy or space flight risks being left behind. This is a challenge not just for ministers and regulators, but for all of us. It is one we have to rise to.



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