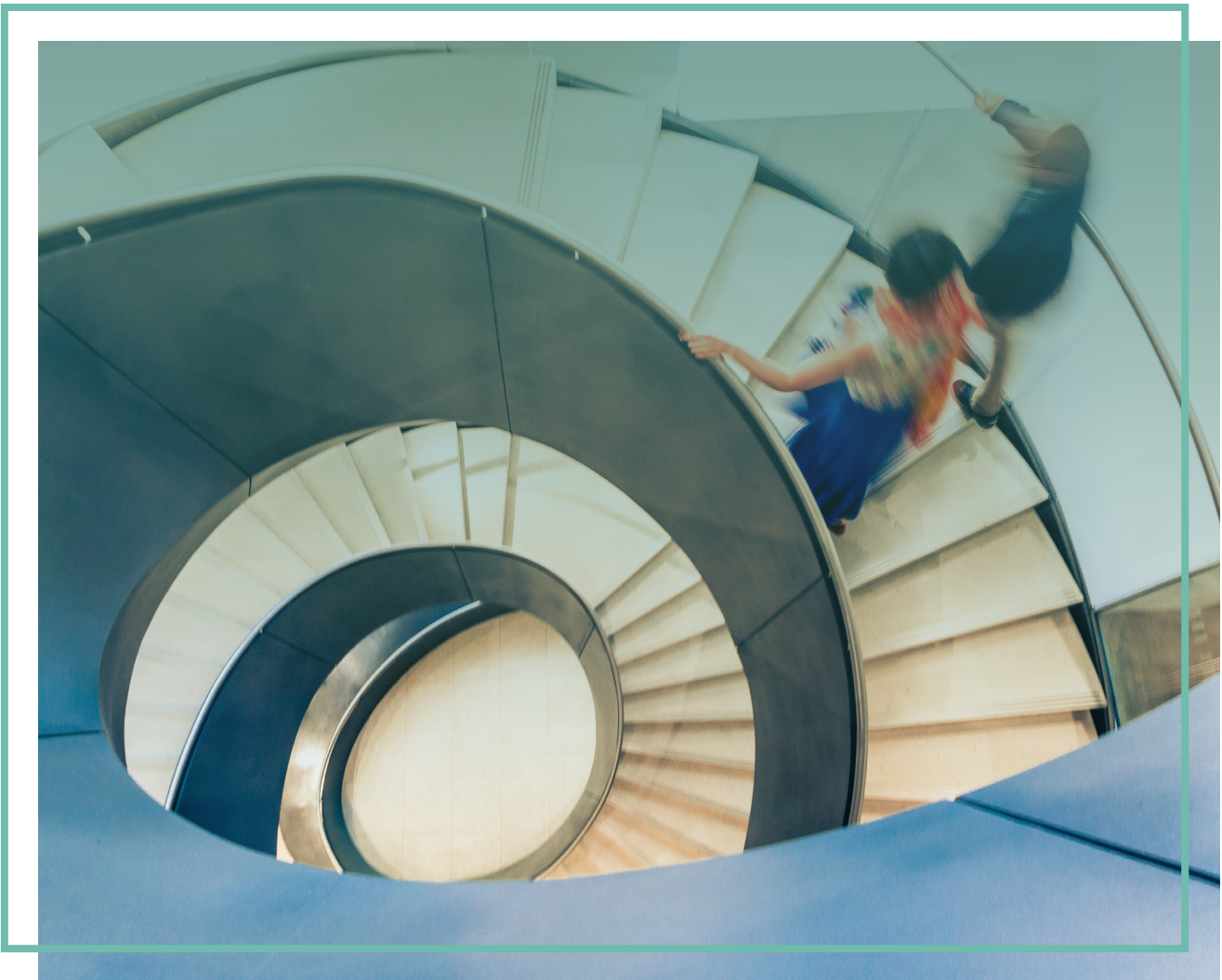


Enduring strengths

Analysing the UK's current and potential economic strengths, and what they mean for its economic strategy, at the start of the decisive decade

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The Economy 2030 Inquiry

The Economy 2030 Inquiry is a collaboration between the Resolution Foundation and the Centre for Economic Performance at the London School of Economics, funded by the Nuffield Foundation. The Inquiry's subject matter is the nature, scale, and context for the economic change facing the UK during the 2020s. Its goal is not just to describe the change that Covid-19, Brexit, the Net Zero transition and technology will bring, but to help the country and its policy makers better understand and navigate it against a backdrop of low productivity and high inequality. To achieve these aims the Inquiry is leading a two-year national conversation on the future of the UK economy, bridging rigorous research, public involvement and concrete proposals. The work of the Inquiry will be brought together in a final report in 2023 that will set out a renewed economic strategy for the UK to enable the country to successfully navigate the decade ahead, with proposals to drive strong, sustainable and equitable growth, and significant improvements to people's living standards and well-being.

The Nuffield Foundation

The Nuffield Foundation is an independent charitable trust with a mission to advance social well-being. It funds research that informs social policy, primarily in Education, Welfare, and Justice. It also funds student programmes that provide opportunities for young people to develop skills in quantitative and scientific methods. The Nuffield Foundation is the founder and co-funder of the Nuffield Council on Bioethics and the Ada Lovelace Institute. The Foundation has funded this project, but the views expressed are those of the authors and not necessarily the Foundation. Visit www.nuffieldfoundation.org.

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Executive summary

A decade of stagnant living standards, weak productivity and low investment combined with a coming decade of major change – driven by Covid-19, Brexit and Net Zero – mean that it is crucial for the UK to renew its economic strategy.

The received wisdom is that the UK is a narrowly specialised economy; that it is only competitive in financial services and ancillary business services; and that this specialisation has come at the expense of our manufacturing industry and the high-quality jobs it provides. By ending our reliance on banking and reindustrialising, so the thinking goes, we can revitalise our economy. In this report, we argue that these are poor premises on which to base a new economic strategy. Policy makers should instead pay attention to the reality of the UK's existing and potential economic strengths and how slowly they typically evolve. Building on these, and dealing with the trade-offs they present, will be key to a successful new economic strategy.

This report considers the UK's present comparative advantages in exports and innovation, analysing how long they have existed and where they come from. We consider whether these strengths are indeed especially narrow or unusual compared to other countries, and also show which other countries share our patterns of specialism. We assess the prospects for some of our current key specialisms, and we analyse what challenges the UK's comparative advantages pose for an economic strategy that seeks to provide good quality employment and to reduce inequality.

The UK is a services-exporting superpower, but it is not narrowly focused on finance

The UK was the fourth-largest exporter in the OECD in 2019 (behind Japan, Germany and US), and the fifth-largest in the world (also behind China), exporting nearly \$900 billion worth of goods and services. But within this we have a very large specialisation in services: we exported \$418 billion worth of services in 2019, the second-highest in the world. At just over 45 per cent of total exports, the UK's services share is roughly twice that of the OECD average, and 1.8 times the global share. This is a far larger share than any country of a comparable size: among large rich economies, the US, France and Spain also specialise in services, but to a far lesser extent, with roughly a third of their exports being services. In contrast, Japan, Germany and Korea specialise successively more strongly in goods, with services amounting to less than a fifth of their exports.

Within this services specialism, the UK has a well-known, strong advantage in financial services, insurance and other business services, exporting more than double the global average share (\$230 billion across these three services categories). However, financial services have been falling as a share of exports – from 12 per cent in 2009 to 9 per cent in 2019. And the UK is also a strong exporter in other services, such as personal, cultural and recreational services (including education), where our export share is one-fifth larger than the global average (totalling \$5.7 billion in 2019). The UK also earns a lot from charges for intellectual property (such as royalties to broadcast UK-produced TV shows abroad). The UK also has strengths when it comes to exporting in a number of goods categories; a larger-than-average share of our exports are in aircraft, art, beverages and pharmaceuticals. There are clearly some goods where the UK has real relative strengths: it is not a services one-trick pony. The UK's single biggest relative weaknesses is in electrical machinery and equipment, where the share in our exports is around half the global share.

Taken together, these specialisations are relatively varied. On a range of statistical measures, the breadth of the UK's trade mix is average by the standards of medium-sized industrialised countries, meaning that the UK is not particularly concentrated, nor diversified, in its exports. We are slightly more specialised than France or Germany, but less specialised than Japan, and much

less specialised than small but rich countries like Switzerland and Ireland. The UK's pattern of specialism is therefore not unusually narrow or idiosyncratic. However, while the absolute size of UK exports in 2019 was only slightly smaller than other rich countries in relation to both the size of the economy (i.e. openness) and to imports (i.e. the trade balance), UK exports substantially underperformed our international peers' in 2020-21.

Our focus on services is not to blame for the UK's economic stagnation

Statistical analysis suggests that there are several broad types of exporting countries based on their revealed patterns of specialisation: one group comprises manufacturing-heavy countries, including Germany and several East Asian economies, and there is also a services-intensive group that includes the UK, France, the United States and Singapore. All of the latter three countries have higher GDP per capita than the UK, suggesting that a services focus can be consistent with higher levels of productivity and income than the UK's has been able to achieve.

Moreover, while UK exports grew moderately slowly in the decade to 2019, at an average rate of 3.3 per cent per year (in dollar terms) — similar to the 3.1 per cent growth enjoyed by Germany but much slower than the 4.8 per cent for the US — none of this underperformance was due to the UK's product mix. It is the case that in 2009 the UK was specialised in products that, on average, saw relatively strong worldwide growth in exports in the ten years that followed, meaning product mix explains none of the 1.5-percentage-point shortfall in growth in UK exports when compared to the US over this period. The gap is therefore instead explained by the UK losing share in the markets in which it exports.

Both these factors suggest that the UK's specialisation in services does not of itself explain the shortfall in productivity and incomes relative to the international frontier, nor the recent stagnation in its productivity growth.

A new economic strategy must recognise that economic specialisations have tended to develop slowly

Most developed countries, including the UK, have not changed their specialisms much over the course of recent decades.

For example, the UK's strength in services was present in 1980, before the rapid deindustrialisation of its economy was complete, although it did increase significantly in the late-1990s, peaking around the time of the financial crisis. Of the top 10 products in which the UK was most specialised in 1989, seven were also in our top 10 in 2019, and the top two then – financial services and beverages – are still the top two now.

More broadly, comparative advantage in most product categories has not tended to change much over time: internationally, we find that a country's revealed comparative advantage (RCA) in a product ten or even thirty years ago has generally been a good predictor of that country's RCA today. The extent of this 'persistence' in the UK is similar to other advanced economies. Large swings from goods to services or vice versa are rare: among countries comparable to the UK – i.e. high-income OECD countries who did not undergo a post-communist transition – since 1980, only Finland and Norway have experienced a change of a magnitude sufficient to move the UK from being a services specialist to a country that exports goods and services in the same proportions as the rest of the world.

A renewed economic strategy cannot ignore the UK's history and current endowments: it needs to build on these areas of strength and protect them from new risks. Key areas of long-standing UK specialisation rely on a highly educated and innovative workforce, and international openness to talent and ideas. In the case of finance and business services, the UK's specialisation reflects London's role as an international financial centre. The UK's creative strengths can be traced to cultural openness, high quality creative education and – in media – the important role that public service broadcasting has in shaping the market. Pharmaceuticals, as part of the wider life sciences sector, draws on and contributes to the UK's strong science base.

But although an economy's strengths are persistent, they are not immutable. For example, we show that it would only be a 'short hop' from the UK's current mix of goods specialisation to several other product areas in which the UK could grow its exports, including products across several machinery and pharmaceuticals categories. Patenting activity of UK-resident inventors also highlights areas in which the UK's advantages could grow. The UK is innovative in chemistry and the associated fields

of pharmaceuticals and biotechnology. Although these fields saw relatively weak growth in global patenting activity in the decade to 2015, they are widely recognised to be growth areas of the future. The UK also has a promising strength in patents relating to clean technology, where further growth is anticipated due to international commitments to Net Zero. A successful economic strategy needs to capitalise on these new areas of high growth opportunity, while building on existing strengths.

Any choices about the UK's future specialisation must address trade-offs with geographic inequality and Brexit

We have seen with the examples of Singapore, the United States and France that a specialisation in services can be consistent with high incomes. Moreover, services specialists exhibit a wide range of institutional characteristics: it's not the case, for example, that only low-tax economies can thrive as service exporters.

One thing the goods exporters have in common is that, on average, they have somewhat higher levels of physical and human capital: countries in the manufacturing group include post-Communist and East Asian countries with traditions of high investment. The manufacturing group on average has 4 per cent more physical capital and 10 per cent more human capital in relation to the size of their economies than the services group. For the UK to close this gap, it would require additional investment of approximately 2 per cent of GDP for a decade, and correspondingly lower consumption or higher imports. And, although higher investment may be helpful to succeed more broadly in manufacturing, it is not sufficient: the know-how that enables companies to employ capital and labour productively is largely tied up within firms. Furthermore, manufacturing employment is only 8 per cent of the total, suggesting that the number of extra jobs available from even a proportionally large expansion in manufacturing would be limited.

Specialising in services is associated with high average incomes, but there is evidence that incomes generated by tradable services may be spread unevenly across individuals and regions. More productive parts of the UK specialise more in services trade, whereas there is no relationship between the level of regional output per hour and goods exports: this suggests that services

could be reinforcing geographical gaps within the UK in value added, a key measure of spatial inequalities. Moreover, a similar fact is true across the wage distribution: workers in tradable goods industries are (roughly) 20 per cent more likely than average to have jobs in the upper-middle part – i.e. 50th to 90th centiles – of the wage distribution. In contrast, workers in tradable services – e.g. bankers and management consultants – are most overrepresented at the very top, being 60 per cent more likely than the average worker to have jobs paying about the 95th percentile of the wage distribution. Jobs in non-tradable services are most common at the bottom of the wage distribution.

On the other hand, France is an example of an economy with lower inequality than the UK (with a Gini coefficient of 0.292 compared to 0.366 in the UK in 2019) that specialises in services, albeit less so than the UK (France's share of exports in services is 1.4 times the world average). So, services specialisation does not inexorably lead to high inequality.

Finally, the UK's export strengths will be challenged by the form of our new trading relationship with the EU. The UK's specialisation in services increased over a long period of deepening trade liberalisation with the EU, especially in services. The Trade and Co-operation Agreement has resulted in much higher trade barriers for UK exports, especially in a range of regulated services, for which it contains limited provision. Policy makers will have to wrestle with the trade-offs involved in a partial re-integration into EU trade, if this option is available to the UK, or deal with and mitigate the consequences of higher trade costs for some of our key export industries.

Future Economy 2030 reports will examine how the benefits of our tradeable sectors can be more deeply exploited and more widely spread throughout the country, and how trade and industrial policy, inter alia, can bring this about.

Section 1

Introduction

The UK's recent past has been characterised by stagnant living standards, weak productivity and low investment across sectors of the economy.¹ Alongside this, we face a coming decade of major change – driven by Covid-19, Brexit and the net zero transition – which will challenge the UK's position in the world economy, altering the way the country both consumes and produces goods and services. This context means it is crucial that the UK's economic strategy is renewed, both to make a success of the decade ahead and to revitalise the economic fortunes of people, places and firms around the country.

Key to this is understanding the UK's current strengths and how these strengths should inform industrial, innovation, skills, trade and places policies in the years ahead. In this report, we answer the question of where the UK's strengths lie through the lens of the UK's performance in both exports and innovation relative to other countries across the world.

The core of our analysis centres on exports. When a country exports a good or service, this tells us that the country is either efficient at producing it, relative to other countries and to other products; or that it offers a unique (or differentiated) product or service that is desired by other countries. Looking at exports, therefore, rather than production more broadly, tells us something about how good the UK is at producing products that are valued on the world stage. We also consider the UK's strengths in innovation by analysing patents – a standard measure of innovation output where data is available over time, across countries and at a disaggregated level of technologies – as these can suggest where future growth opportunities lie.

The UK is the fifth-largest exporter in the world

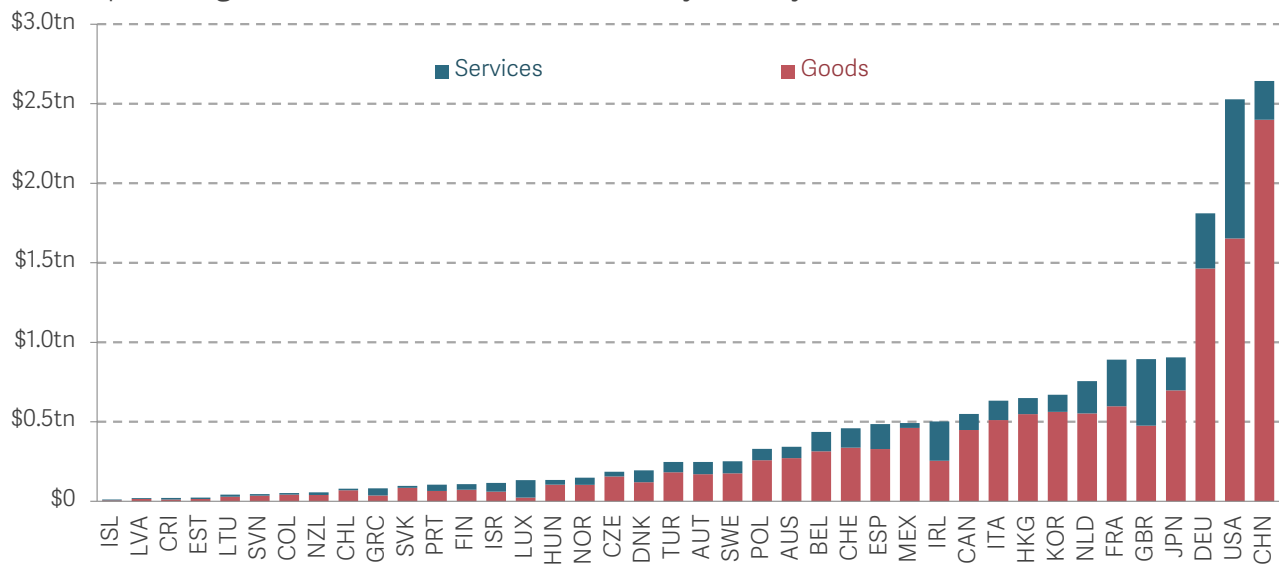
Throughout this report, we focus on the relative strengths of the UK, comparing its share of total exporting (and patenting activity) in each product or technology area with

¹ [The UK's decisive decade: The launch report for The Economy 2030 Inquiry](#), Resolution Foundation & Centre for Economic Performance, May 2021.

the equivalent shares for the rest of the world. But the overall level of exporting and patenting is also clearly relevant when assessing a country’s economic position and growth potential. Figure 1 shows that the UK was the world’s fifth-largest exporter in 2019, exporting a total value of just under \$900 billion of goods and services in that year. Of that, \$418 billion (or over 45 per cent of UK total exports) was in services, meaning that the UK is the second-largest exporter of services, behind only the US.

FIGURE 1: The UK is the fifth-largest exporter in terms of total value

Exports of goods and services (current USD), by country: 2019

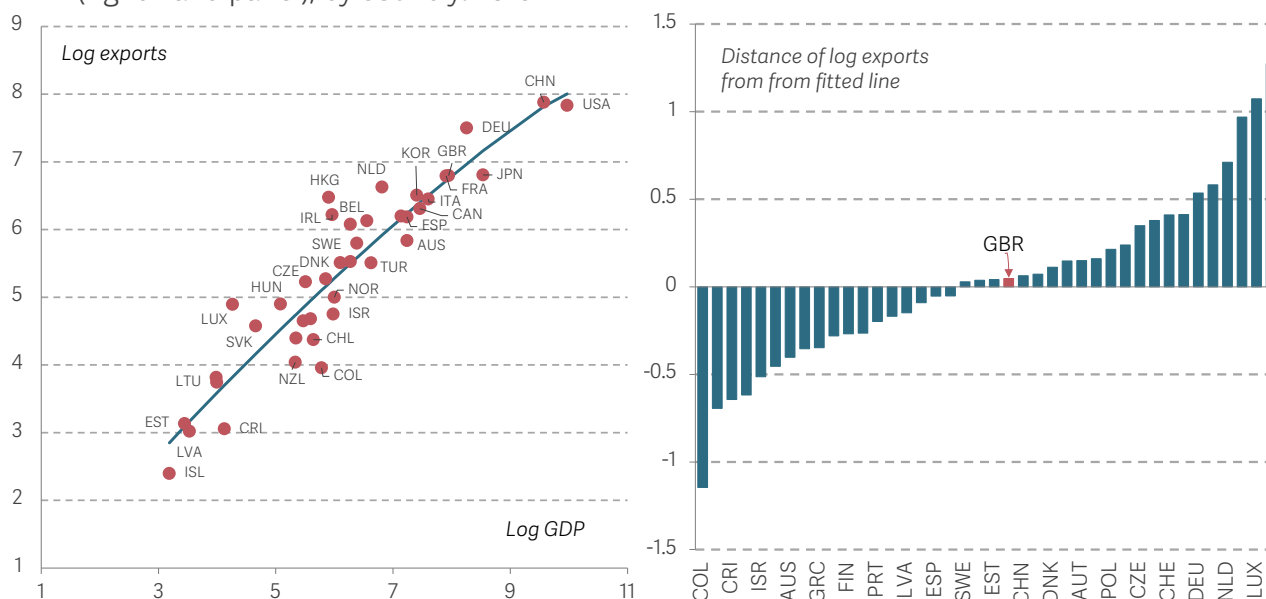


SOURCE: Analysis of International Monetary Fund, Balance of Payments Statistics Yearbook and data files.

Of course, much of the total value of a country’s exports is driven by its economic size. Figure 2 plots the volume of exports against country size and a non-linear fitted line (left-hand panel), showing that this relationship between economic size and exports is strong one. The right-hand panel plots the difference between a country’s exports and the predicted level of their exports based on its size. Some countries such as Luxembourg and the Netherland, shown to the right of the right-hand panel, export a lot relative to their size; others, to the left of the right-hand panel, such as Colombia and Israel, export less than predicted by their GDP. However, contrary to the common perception of the UK as an underperformer in global trade, the country in fact exports around about the amount predicted by the size of its economy.

FIGURE 2: The UK exports about as much as predicted by its economic size

Log exports and log GDP (left-hand panel) and distance of log exports from a fitted line (right-hand panel), by country: 2019

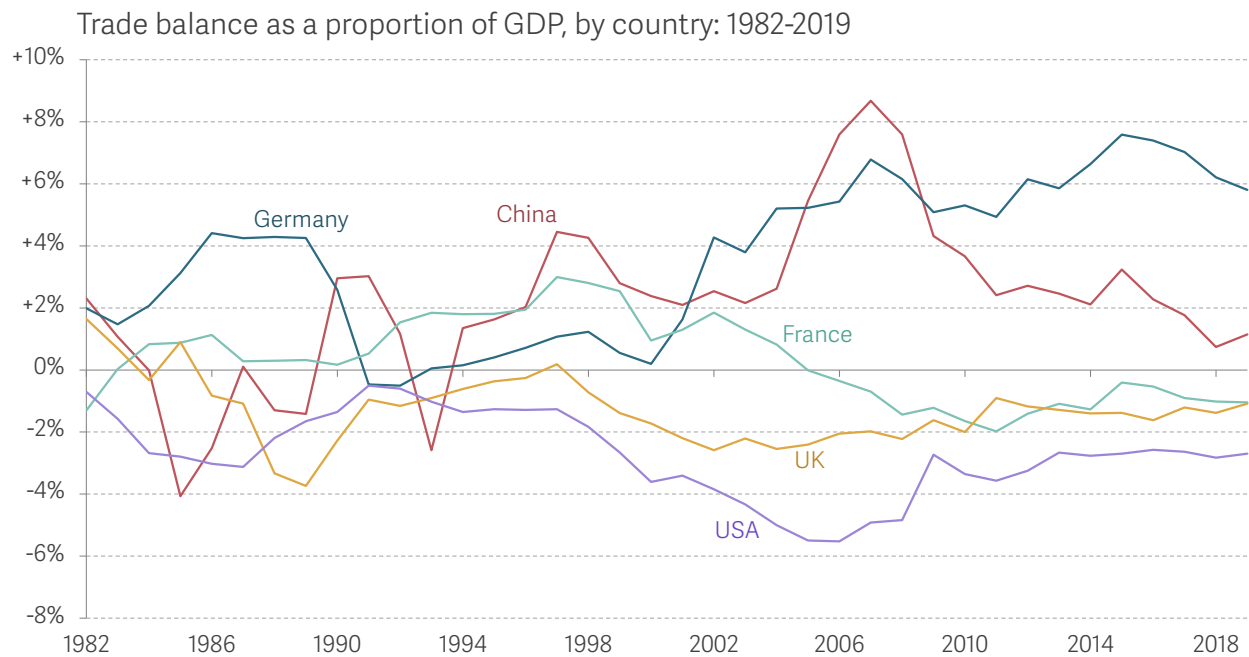


NOTES: Exports and GDP are both in current USD terms in log units (an increase of 1 log unit equates to around 2.7 times more exports or GDP).
SOURCE: Analysis of International Monetary Fund, Balance of Payments Statistics Yearbook and data files.

The trade balance – the difference between the value of a country’s exports and its imports – is also important when considering the international performance of an economy. For many decades, the UK has had a trade deficit – meaning that it imports a higher value of goods and services than it exports – but this has been declining in recent years, and was around 1 per cent of its GDP in 2019 (see Figure 3). Policy makers sometimes put too much weight on trade balances, viewing exporting as always “good” and importing as, overall, “bad”. This is an oversimplification. There is evidence that import competition and offshoring can displace employment², but it can also lower prices to consumers³ and increase access to intermediate imports – which make up roughly two-thirds of international trade – which in turn will improve firms’ efficiency and should therefore lead to higher wages. Similarly, exporting seems to make firms more productive,⁴ but increased export intensity may also lead to firms increasing markups faster than their productivity increases, potentially leading to higher prices for domestic consumers.⁵

2 See: D Acemoglu et al., *Import Competition and the Great US Employment Sag of the 2000s*, Journal of Labour Economics, 2016, and: D Hummels et al., *The Wage Effects of Offshoring: Evidence from Danish Matched Worker-Firm Data*, American Economic Review, 2014.
3 A Ariu, F Mayneris and M Parenti, *One way to the top: How services boost the demand for goods*, Journal of International Economics 123, March 2020.
4 J De Loecker, *Do exports generate higher productivity? Evidence from Slovenia*, Journal of International Economics 73(1), September 2007.
5 J De Loecker & F Warzynski, *Markups and firm-level export status*, American Economics Review 102(6), 2012.

FIGURE 3: The UK trade deficit has fallen slightly over the past 15 years



SOURCE: Analysis of International Monetary Fund, Balance of Payments Statistics Yearbook and data files.

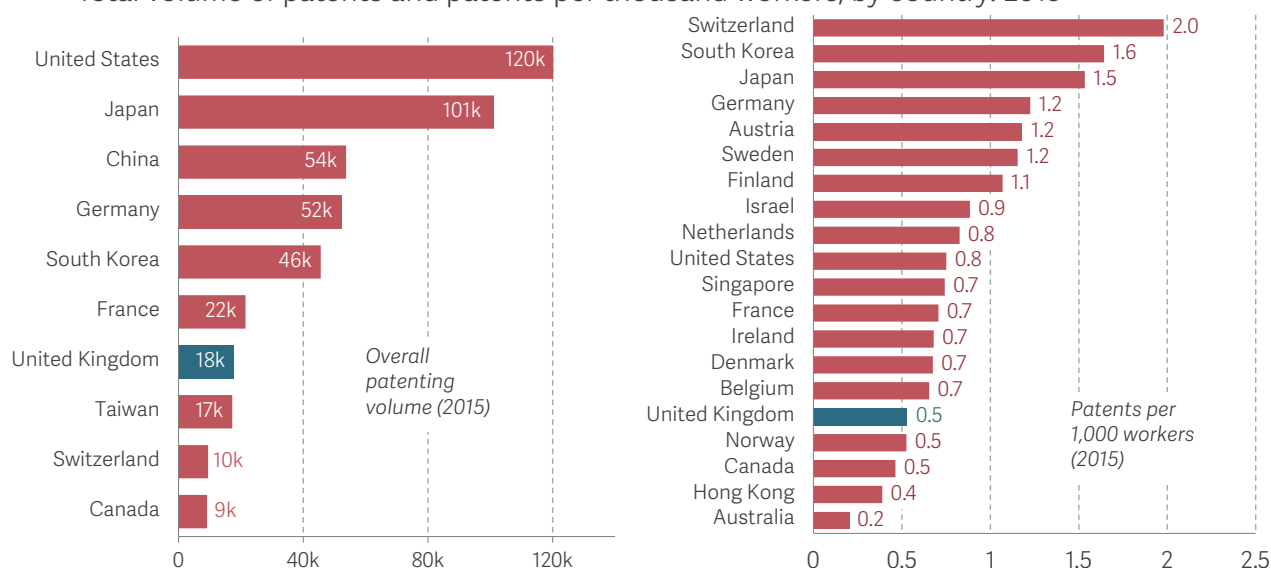
But the UK is not particularly innovative relative to its size

One important measure of innovation is patenting activity. In this paper we mainly focus on relative shares of patenting in different technology classes, but it is important to establish the overall level of patenting.

The UK appears to be an innovative economy, being one of the top-10 innovating countries measured by patenting activity, ranking seventh in 2015. However, if we focus on the intensity of innovation, by considering patents per 1,000 workers, the UK falls down the ranking to sixteenth (see the right-hand panel of Figure 4). On the other hand, much innovation and intellectual property does not get patented, so these figures do not give a full picture of UK innovation.

FIGURE 4: The UK is a top innovator in volume terms, but less so when measured per capita

Total volume of patents and patents per thousand workers, by country: 2015



NOTES: Countries with less than 1,000 patents in 2015 are not included.

SOURCE: Analysis of PATSTAT 2018, Spring edition; World Bank, Total Labor Force, World Development Indicators (derived using data from International Labour Organization, ILOSTAT database).

With these facts about aggregate trade and patenting in mind, we now turn to identifying and understanding the UK's comparative strengths, and what these mean for the UK's economic strategy in the 2020s. To that end the remainder of this report is structured as follows:

- Section 2 identifies the goods and services that the UK specialises in producing, the technology areas in which it innovates, and analyses the breadth of its specialisation.
- Section 3 explores how persistent the UK's specialisms are, and what this means for a wider economic strategy.
- Section 4 takes a closer look at some of the UK's key specialisms to understand how they developed.
- Section 5 considers the positive and negative implications of the UK's advantages, looking at income and growth as well as regional gaps, earnings inequality and the impact of Brexit on these advantages.
- Section 6 concludes with a brief discussion of the implications of our findings for policy making in the 2020s.

Section 2

What are the UK's current advantages?

In designing a new economic strategy to meet the twin challenges of recent economic stagnation and coming change, it is important to understand what the UK's current competitive strengths are and what it does well.

The UK is specialised in services, and this international strength has grown over time. In the 1980s roughly one quarter of the UK's total exports were services and by 2019 this had grown to 47 per cent, while over the same time period services increased from 13 per cent to 24 per cent of total world exports. In value-added terms, services accounted for nearly 70 per cent of UK exports in 2019. The UK is the largest developed economy to be as heavily weighted towards services relative to the overall picture in global trade. However, looking under the surface at a more granular set of products reveals that the UK is also a leader in the export of several goods categories, including pharmaceutical products, aircraft and beverages.

Despite the UK's reliance on services, its exports are not especially narrow. When comparing the UK's export composition with that of total world trade we find that the UK's level of product specialisation is typical of many other mid-size industrial economies. Contrary to the received wisdom, the UK is not solely specialised in financial services – and while it is services-orientated, it has advantages in a broad set of product categories and in some key goods too.

Patenting activity of UK-resident inventors reveals that the UK has strengths in chemistry and the associated fields of pharmaceuticals and biotechnology. And although these fields saw relatively weak growth in global patenting activity in the decade to 2015, they are nonetheless widely recognised to be growth areas of the future. The UK is also promisingly innovative in clean technology.

In this section, we look at the UK's current advantages. We start by introducing the measurement concepts and data we use to capture these advantages. Next, we look at the balance between the broad categories of goods and services, comparing the strength of the UK's specialisation in services with that of other developed nations, before considering more granular goods and service categories to get a richer sense of where the nation's relative strengths lie. We also consider the breadth of the UK's specialisms, considering whether the UK is more narrowly specialised than other comparable countries. Finally, we explore where the UK's key innovative advantages lie.

The UK economy has a large advantage in services

The UK has had a long-standing specialisation in services. In the 1980s, roughly one-quarter (24 per cent) of UK exports were in services, double the global share of 13 per cent. Service exports have grown worldwide, but they still account for a larger share in the UK, reaching nearly half of UK exports (47 per cent) in 2019, versus 24 per cent globally. In value-added terms, services accounts for nearly 70 per cent of UK total exports in 2019.⁶ This specialisation reveals that UK is relatively strong in exporting services over goods – namely that a greater share of the UK's total exports are in services than the share of global exports that are in services – and that this strength is significant for the UK's economic model.

Comparative advantages can emerge for a variety of reasons. Countries differ in the size and skills of their workforce, in their availability of natural resources, and in their accumulated physical capital, all of which may lead to specialisation in industries that have production intensities that align with these characteristics.⁷ Furthermore, the institutions of a country – its legal framework, financial system, and labour market regulations, for example – will also guide a country's specialisation.⁸ Recent research has documented the importance of large global firms in international trade and investment patterns,⁹ and that the idiosyncratic characteristics of firms (such as management and firm-specific knowledge) also contribute to a country's comparative advantage.¹⁰

Revealed comparative advantage (RCA) is a measure of the extent to which a country is specialised in exporting a specific product; it helps reveal where the underlying strengths of an economy lie. It is calculated by comparing the share of a country's total exports in a

⁶ This captures how much of the value of a product is generated in the UK as opposed to being imported from another country.

⁷ See: R Baldwin, [Determinants of the Commodity Structure of US Trade](#), *American Economic Review*, 1971; R Baldwin, [Determinants of Trade and Foreign Investment: Further Evidence](#), *The Review of Economics and Statistics*, 1979; and J Romalis, [Factor Proportions and the Structure of Commodity Trade](#), *American Economic Review*, 2004.

⁸ D Chor, [Unpacking sources of comparative advantage: A quantitative approach](#), *Journal of International Economics* 82, 2010.

⁹ A Bernard et al., [Global Firms](#), *Journal of Economic Literature*, Vol.56, 2018.

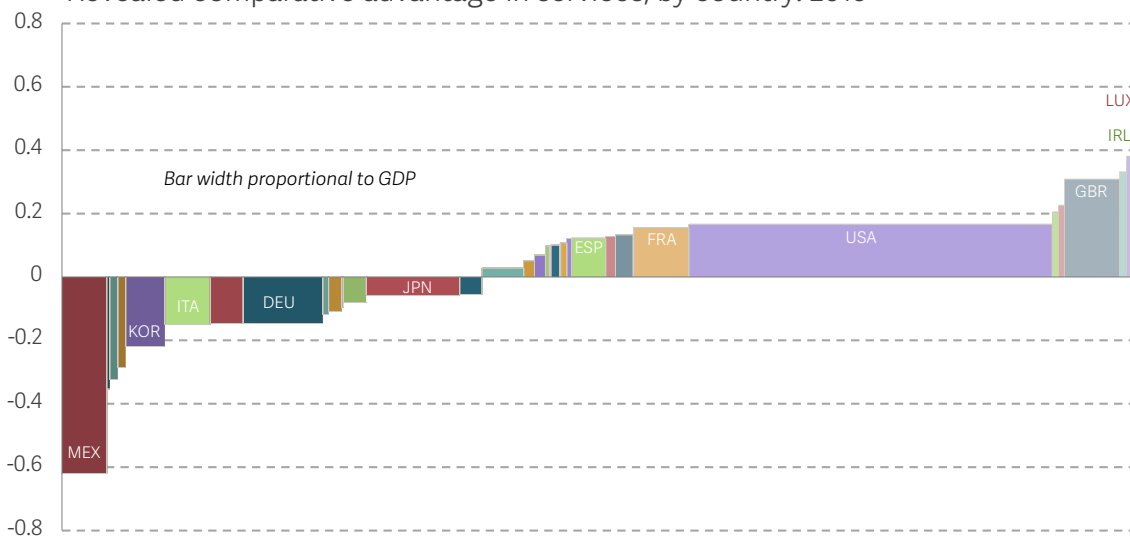
¹⁰ One study estimates that these explain around 20 per cent of a country's total export patterns. See: C Gaubert & O Itskhoki, [Granular Comparative Advantage](#), *Journal of Political Economy*, 2021.

specific good or service to the share of global exports in the same good or service (Box 1 explains this concept in more detail).

Figure 5 shows that the UK’s RCA in services is large: the UK is the sixth-most services-oriented economy in the OECD, and is the most specialised in services among many of its typical comparators, including the US, France, Germany and Italy (nations with bars above the horizontal axis are those where the national share of services in total exports exceeds the global share). The UK is the largest economy to be as specialised in services. In other words, all of the countries that have an even greater RCA in services – such as Ireland and Luxembourg – have substantially smaller economies than the UK (shown by the width of their bars). So, the UK is unusually specialised in services exports given the size of its economy.

FIGURE 5: The UK is more heavily specialised in services than similar sized nations

Revealed comparative advantage in services, by country: 2019



NOTES: The vertical axis measures a country’s RCA in services, with a positive number meaning the country is specialised in services.
 SOURCE: Analysis of Harvard Growth Lab, Atlas of Trade Complexity; OECD-WTO, Balanced Trade in Services; IMF, World Economic Outlook 2022.

BOX 1: Measuring the UK's revealed comparative advantage

Understanding the UK's economic advantages is complex: in principle, this would involve not only exploring what the UK produces, but looking at how its production compares with international competitors, and considering where advantages may emerge in the future. To operationalise this concept, we use a slightly narrower measure of a nation's relative advantages: the "revealed comparative advantage" (RCA) of a country's current production mix.

The RCA of a country measures how specialised a country is in exporting a specific good or service relative to a reference group: here, we use the rest of the world.¹¹ The theory underpinning the measure is that patterns of trade should be determined by a country's relative underlying abilities to produce different products: if a country was more productive at making books relative to growing fruit, then it would make sense for that country to use more of its resources to produce books and export these to other countries which are relatively better at producing fruit, and to import fruit from other countries. Therefore, by studying revealed comparative advantages through international trade patterns, it is possible to identify where countries' relative strengths and weaknesses lie.

RCA is calculated by comparing the proportion of a country's total exports that are accounted for by a good or service with the proportion of total global exports accounted for by that good or service. For example, if half of UK exports were in books, and books only accounted for a quarter of total exports across the world, then we would conclude that the UK was relatively specialised in books (and the value of the RCA would be 2). Throughout this report we adjust these RCA values so that they lie within between -1 and +1,¹² with numbers larger than zero signifying that a country exports more of a particular good or service as a share of its total exports compared to the rest of the world.

By definition, RCA is a measure of relative export shares, so a country will have a positive RCA in some products or services, and a negative share in others (it is impossible, for example, for both the fraction of goods in UK exports to be greater than the share of goods in global exports, and the fraction of services in UK exports to be greater than services' global share). Identifying these categories for the UK, and assessing the magnitude of advantages reveals the country's strengths and how these compare to other economies.

¹¹ The RCA measure was popularised by: B Balassa, *Trade Liberalization and 'Revealed' Comparative Advantage*, The Manchester School of Economic and Social Studies 33: 92–123, 1965.

¹² The transformation takes the form $(RCA_{raw} - 1)/(RCA_{raw} + 1)$, where RCA_{raw} refers to the untransformed RCA calculated as described in Box 1, and which takes values between zero and infinity.

We use two trade datasets to calculate RCAs in this report. The first is sourced from Harvard Growth Lab's Atlas of Economic Complexity, which is a cleaned version of goods data produced by the United Nations Statistical Division (COMTRADE) combined with services data from the IMF Direction of Trade database. This allows for analysis back to 1980. One drawback is that services products are grouped into

five broad categories, which limits the granularity of our analysis. For more recent time periods, we combine the goods export data with the OECD-WTO Balanced Trade in Services (BaTIS) dataset, which provides disaggregated services trade across twelve categories, allowing for a more detailed exploration of the UK's advantages; however, this dataset is only available from 2005 onwards.¹³

A more granular analysis shows the UK also has revealed advantages in several growing goods categories

Given how large the services tilt of the UK economy is, it has become received wisdom that the UK is narrowly specialised, competitive only in financial services and other business services which are ancillary to the world of finance. However, while the UK is very specialised in exporting services, analysing more granular product-level data shows that the UK is far from a one-trick pony: it has advantages across a diverse range of services, as well as across some key goods categories.

Figure 6 plots the UK's RCA in various goods and services categories in 2019 against growth in trade volumes over the previous decade; the size of the bubble denotes the product's share in total global trade. In services exports, the UK's RCA is especially high in finance, insurance and pensions, and "other business services".¹⁴ These are all areas where global exports have been growing even prior to the Great Financial Crisis. Other business services, for example, has seen global exports grow by 6.6 per cent a year over the past decade, and, in 2019, represented over 7 per cent of global exports. Figure 39 in the annex also shows that these services areas are strong areas of specialism for the UK when considering Trade in Value Added (TiVA), a measure of exports which adjusts for the import content of a product.¹⁵

¹³ In the next section we study persistence in RCAs, and we expect that broader product categories are likely to lead to more persistence in the products in which a country specialises relative to using more disaggregated product categories. We therefore also study the extent of changes in RCA for particular product categories over time as well as changes across categories.

¹⁴ This is the category available in the BaTIS trade data (based on EBOPS 2010), which includes R&D services, professional and management consulting services (this category includes law, accounting, consulting, advertising, architecture, engineering and scientific services), technical, trade-related and other business services.

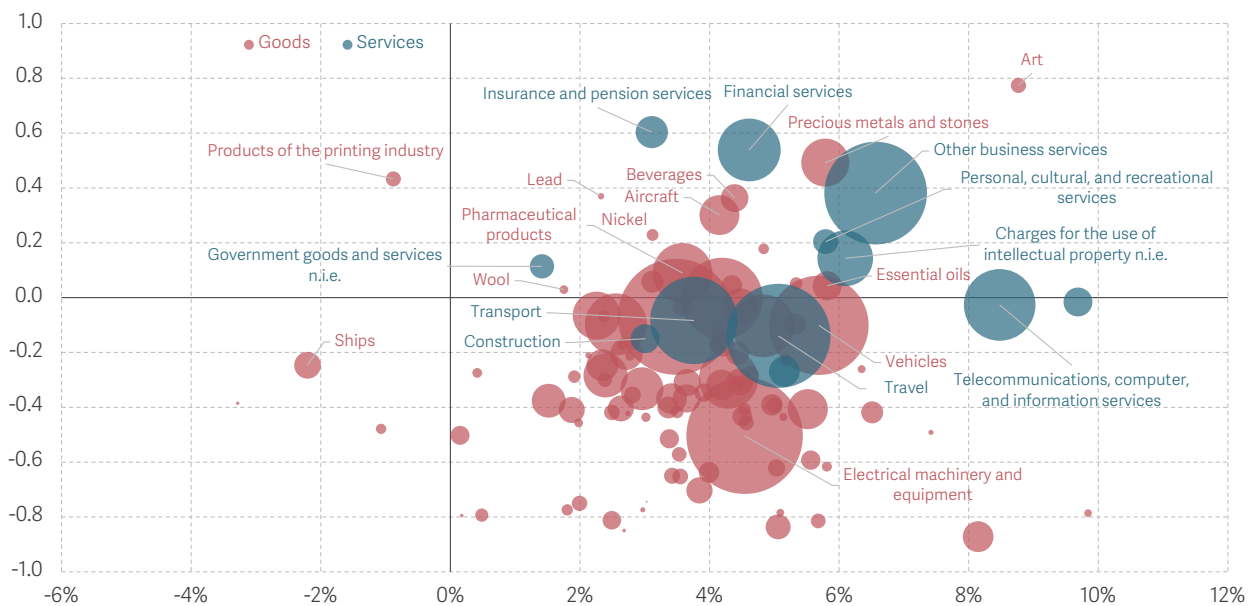
¹⁵ For the main analysis, we choose to use data on exports as it is directly measured and does not require the assumptions that are necessary to construct estimated data on trade in value added.

However, the UK is also specialised in several other services categories which reveal a much broader set of advantages. The UK's RCA is high in personal, cultural and recreational services (which include education and health services), as well as in charging for the use of intellectual property (which includes charges for franchises and trademarks as well as licences to reproduce audio-visual products), another area of recent growth. Both of these areas have seen average annual growth of around 6 per cent. Moreover, this strength in a broad range of services is complemented by notable advantages in a number of goods categories. For example, the UK is specialised in pharmaceuticals, as well as beverages, aircraft, and works of art. Pharmaceuticals, in particular, represent 2.5 per cent of global exports, and have grown by 3.6 per cent per annum globally. Together these four goods categories account for 8 per cent of UK total exports, worth \$65.5 billion in 2019. In Section 4, we provide case studies for some of these sectors, exploring in more detail their history and contribution to the UK economy, as well pointing towards potential risks and policy issues that need to be addressed as part of a new economic strategy for the UK.

There are, though, a number of large and growing goods areas where the UK clearly does not have advantages: electrical machinery and equipment and vehicles are two that stand out.

FIGURE 6: The UK is specialised in services categories but also has export advantages in some goods

Revealed comparative advantage and 10-year annualised growth in global export value, by product category: UK, 2019



NOTES: The horizontal axis measures compound annual growth rates of volumes between 2009 and 2019. The vertical axis shows the revealed comparative advantage in 2019. The size of the bubbles corresponds to each product's share in world trade in 2019.
 SOURCE: Analysis of Harvard Growth Lab, Atlas of Economic Complexity (HS version) and OECD-WTO, Balanced Trade in Services.

How does the UK compare to other advanced industrial economies?¹⁶ Germany has comparative advantages in many large and growing goods categories, such as vehicles and industrial machinery, which together comprise over 15 per cent of global trade. The German economy's relative weakness in services is also clear to see: maintenance and repair services and insurance are the only service areas in which it outperforms global exports. In contrast, the United States has positive RCAs in many faster-growing service product categories – some of which it shares with the UK – for example, in charges for use of intellectual property (which grew at an annual rate of over 6 per cent during the past 10 years), as well as in goods categories such as medical apparatus (comprising 2 per cent of global exports and growing at almost 5 per cent per year) and plastics (which amounts to over 2 per cent of global exports). Looking at the balance between specialisation in goods and services categories and their recent growth suggests that the UK's current strengths are not badly placed relative to industrialised peers.

Looking across all goods and services, the UK is not narrowly specialised when compared to medium-sized industrialised countries

The high-level categories of goods and services shown in Figure 5 are very diverse, so it is possible for a country's exports to be balanced between the categories of goods and services but for it also to have a narrow export base when considering more granular product categories. For example, a country could export total goods and services in the same proportions as the world, but could be very specialised within these categories, producing only cars and machinery among goods, and tourism among services. The converse can also be true, and we have seen that for the UK which, despite being more heavily specialised in services exports than any country of comparable size, also has high RCAs in a number of categories of goods.

To assess a country's overall degree of specialisation, it is therefore important to look across all categories of goods and services at once. One way to measure a country's overall specialisation is to show how different that country's distribution of exports across products is from the world distribution.¹⁷ A country that exports all products in the same proportion to the world would be thought of as being broadly specialised, whereas a country that only exported one product would be narrowly specialised (and even more narrowly specialised the smaller that this product's share is in world trade).

The UK's degree of specialisation is fairly typical for a medium-sized industrialised country, somewhat higher than in France and Germany, but less than in Japan (see

¹⁶ The Annex includes equivalent charts for Germany, the United States and China.

¹⁷ We use the symmetrised Kullback-Leibler divergence between the distribution of each country's export shares and the share in the sum of exports by the OECD, China and Hong Kong. Both components of the symmetrised divergence give roughly similar rankings in these data. See: S Kullback & RA Leibler, *On information and sufficiency*, The Annals of Mathematical Statistics 22, 1951.

Figure 7). On this measure, the UK is much less specialised than small, high-income services specialists such as Switzerland or Ireland, or medium-sized commodity exporters such as Chile, Canada or Australia. Far from being narrowly specialised in a small set of high value business-related services, the UK's export mix is comparably broad to that of most developed economies.

FIGURE 7: The specialisation of UK exports is typical for a mid-sized industrialised country

Index of export specialisation, by country: 2019

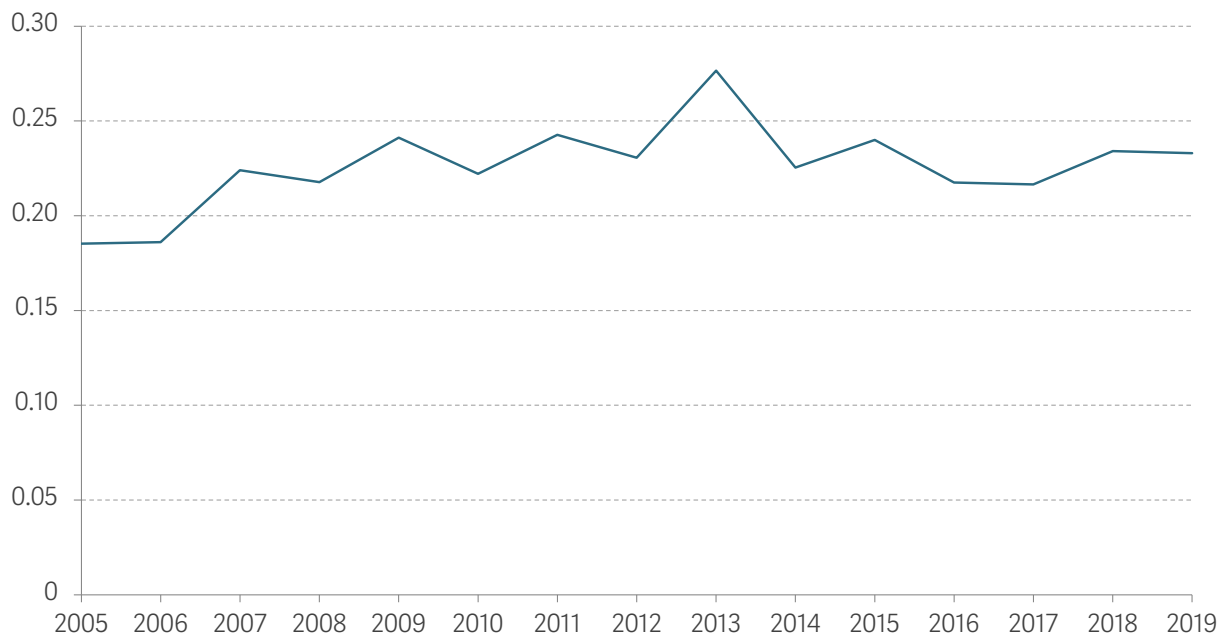


NOTES: The chart shows the symmetrised Kullback-Leibler divergence between the distribution of each country's export shares and the share in the sum of exports by the OECD, China and Hong Kong. A value of zero is the minimum possible value, and indicates that the country's shares are identical to the world's, while larger values indicate that the distribution of world shares is a poor summary of the country's shares. SOURCE: Analysis of Harvard Growth Lab, Atlas of Trade Complexity; OECD-WTO, Balanced Trade in Services.

Moreover, this measure of the UK's overall specialisation has been broadly stable since 2005. Using the more disaggregated services data available in the BaTIS dataset, Figure 8 shows that the past fifteen years have seen minimal change in the extent to which the UK's export mix has differed from the mix of world trade.

FIGURE 8: The UK has not become more narrowly specialised over the 2005-2019 period

Index of export specialisation: UK, 2005-19



NOTES: The chart shows the symmetrised Kullback-Leibler divergence between the distribution of the UK's export shares and the world share, estimated separately in each year. A value of zero is the minimum possible value, and indicates that the country's shares are identical to the world's, while larger values indicate that the distribution of world shares is a poor summary of the country's shares.

SOURCE: Analysis of Harvard Growth Lab, Atlas of Trade Complexity; OECD-WTO, Balanced Trade in Services.

The findings of Figure 7 and Figure 8 are in line with previous research, which shows that countries are broadly similar in their degree of specialisation, and that the extent of specialisation is relatively consistent over time, even if there is some churn in the specific industries that countries are most productive in.¹⁸

Patent data reveals the UK's innovative strength in clean technology, pharmaceuticals and biotechnology

The RCA gives important information about the UK's current relative product strengths, but it is also useful to consider the areas in which the UK innovates, as these areas are a good guide to where future value will be generated. To do this, we consider the country's revealed technological advantage (RTA), an analogue of RCA, but calculated using data on international patenting activity across categories of technology classes (with innovation in a single class being potentially relevant for multiple sectors in the economy). Box 2 explains the methodology and data.

¹⁸ In particular see: G Hansen, N Lind & M Muendler, *The Dynamics of Comparative Advantage*, NBER Working Paper 21753, November 2015.

Although it is true that not all innovation is patented – particularly in the services sector – patents are a standard measure of innovation output, as data are available internationally, over time, and at a detailed technological level which lends itself to comparative analysis of this type.

BOX 2: Revealed Technological Advantage

Our measure of the UK's RTA in a particular technology class is simply the UK share of patents in that class, divided by the share of global patents in that same technology class. This statistic offers a proxy measure of the areas in which the UK is relatively more innovative, and where advantages and value have been realised in production, or could materialise in the future.

Data comes from the 2018 Spring edition of the Worldwide Patent Statistical Database (PATSTAT Global) published by the European Patent Office (EPO). Given that data are available with lags, the latest complete year in our analysis is 2015. Our analysis

focuses on patent “families”: sets of patents that cover similar technical content. We restrict the analysis to patent families which consist of more than one patent application, which is a way of including only higher-quality patents. We identify the country of origin for these patent families by mapping them to the current country of residence of the corresponding inventors (see Annex). Patents are classified in specific technological classes according to the Cooperative Patent Classification system, which includes a category of patents which relate to climate change mitigation which we label as ‘clean’ technologies.

Figure 9 plots the UK's RTA in several broad technology classes alongside the annualised growth of these classes in global patenting. Consistent with our findings in the analysis of traded goods, the UK is specialised in the life sciences, including categories such as pharmaceuticals, biotechnology and also medical devices.¹⁹ Globally, these categories are large (accounting for 7 per cent of patenting in volume terms), though they have been declining over the past decade.²⁰ The UK also has an RTA in high growth areas such as 3D printing and Robotics, but they make up a small share of the global innovation activity (indicated by the smaller bubbles).

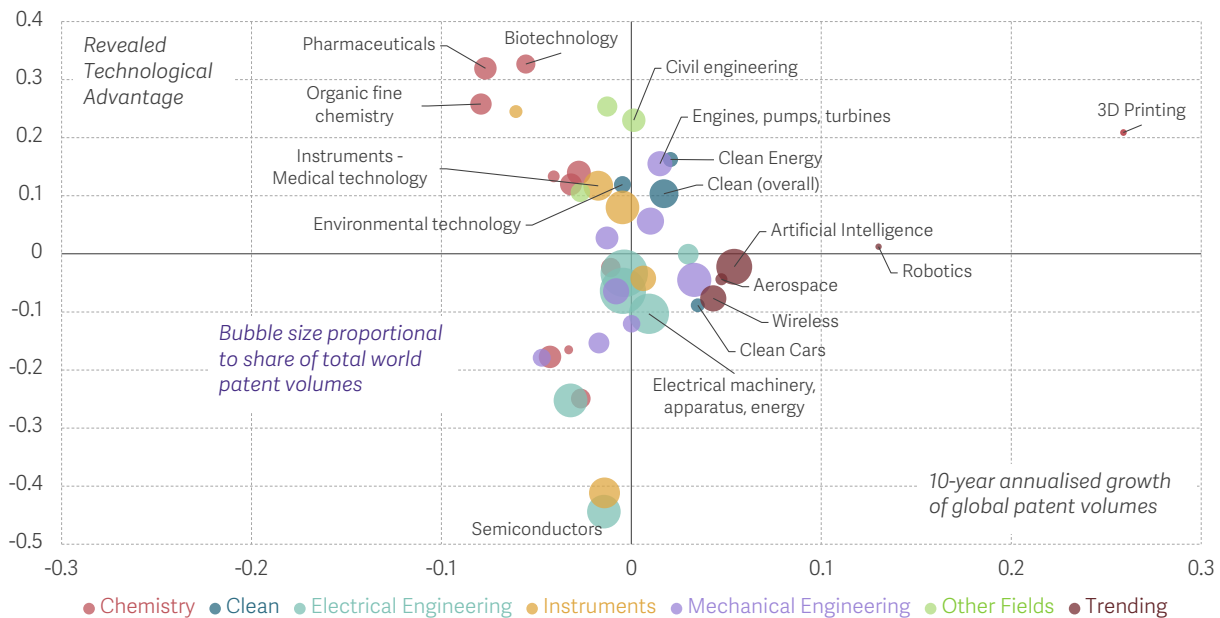
¹⁹ More granular analysis in terms of technology classifications (not shown here) shows that the UK has RTA in a number of areas where global patenting is growing: including aircraft and aviation, drilling and mining, and technologies for climate change mitigation.

²⁰ The UK's ability to contribute to finding solutions to large-scale and global societal issues such as climate change and resilience to pandemics, while generating economic returns, has been highlighted in previous reports using similar analysis. See: R Martin et al., *Innovation for a Strong and Sustainable Recovery*, Centre for Economic Performance, December 2020.

But there are other large and high growth technological areas where the UK does not have a positive RTA overall, such as artificial intelligence and wireless (these account for 8 per cent of total volumes currently); by contrast, these are two areas in which both the United States and China are highly specialised (see Annex). Consistent with our analysis of trade data, the charts in the Annex demonstrate Germany’s RTA lies in transport, mechanical elements, engines, pumps, and turbines. The strong correlation between areas of RCA and RTA demonstrates how the innovative capacity of a nation helps to develop and maintain its export specialism.

FIGURE 9: UK specialisation is focused on innovation in life sciences, but clean technologies present a growth opportunity

Revealed Technological Advantage by broad technology categories: UK, 2015



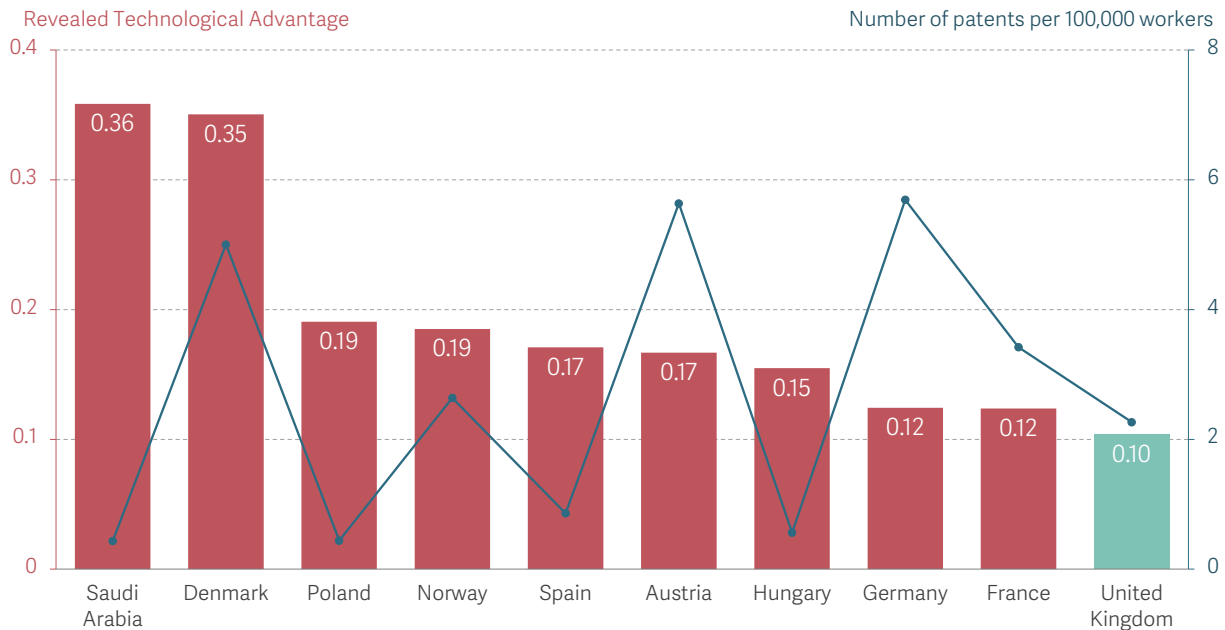
NOTES: The vertical axis denotes the RTA bounded between -1 and 1, the horizontal axis represents the 10-year annualised growth for broad technological categories, and the size of the bubbles represents the share of the technological category in overall patenting activity in 2015. Clean (Overall) includes all patents under the CPC class “Y02” i.e., climate change mitigation technologies. These also include patents under the other technology categories such as clean cars, environmental technology and clean energy.
SOURCE: Analysis of PATSTAT 2018, Spring edition.

Figure 9 shows that the UK also has a technological advantage in innovation related to clean technologies, an area whose share in total global patenting increased by 2 per cent annually, on average, in the 10 years to 2015. Given Net Zero commitments in the UK and internationally, it is reasonable to expect that this area will accelerate, and so ensuring the UK exploits this growth in the coming decade will be important. Among the nine countries with a higher RTA than the UK in clean technologies, five (Denmark, Norway,

Austria, Germany and France) patent more intensely in this area than the UK (see Figure 10). A future Economy 2030 inquiry report will analyse opportunities for the UK in clean technologies and services in more detail.

FIGURE 10: The UK is specialised in innovation in clean technologies

Revealed technological advantage and patent volumes per 100,000 workers in clean technologies, by country: 2015



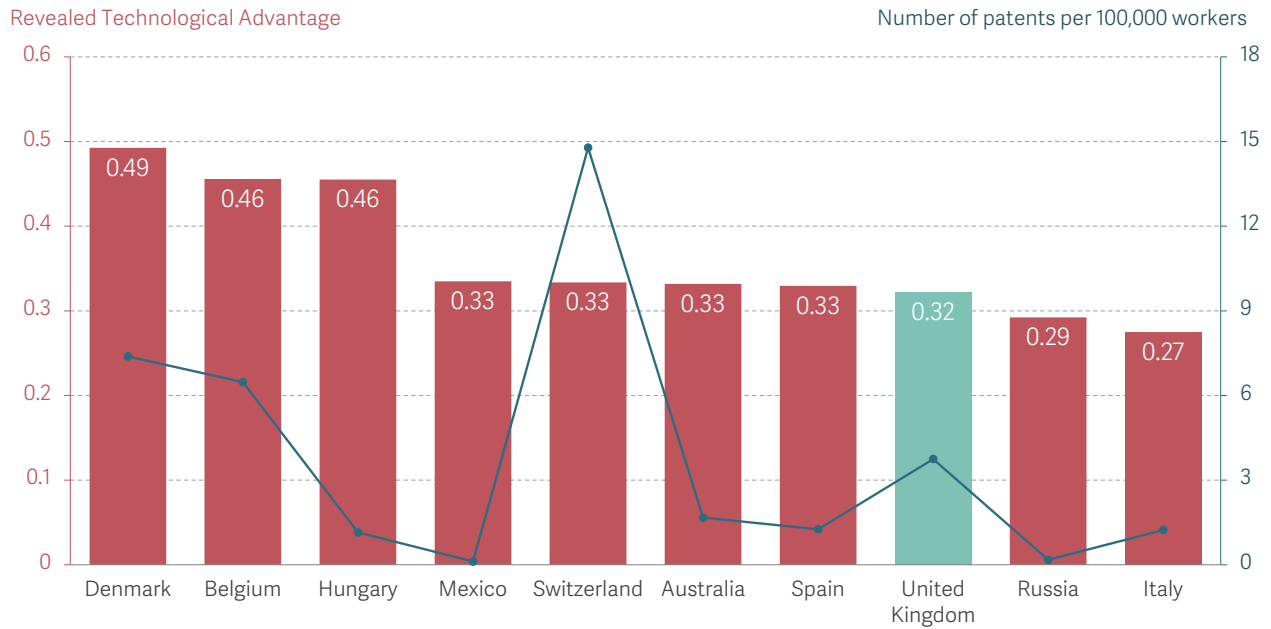
NOTES: Only countries with more than 500 patent families in 2015 are included.
SOURCE: Analysis of PATSTAT 2018, Spring edition.

Among countries with a high RTA in life sciences technology categories (such as biotechnology and pharmaceuticals), the UK performs similarly to how it does in clean technologies with relatively middling levels of patenting intensity, producing roughly 3 patents per 100,000 workers in biotechnology, with Switzerland producing 15 patents per 100,000 workers and Denmark and Belgium both producing 7 and 6 respectively (see Figure 11). Therefore, while the UK has specialisms in promising areas of innovation, raising the overall absolute level of innovation in the UK economy will be key to unlocking these opportunities in the future.

This section has shown that, although the UK has a strong advantage in exporting services it is by no means excessively specialised or narrowly focussed in these products when compared to the rest of the world. The UK's current set of specialisations are in many fast-growing areas, such as charges for intellectual property use and business services, and include several goods categories.

FIGURE 11: The UK is a leading innovator with strong specialisations in biotechnology and pharmaceuticals

Revealed technological advantage and patent volumes per 100,000 workers in biotechnology and pharmaceuticals, by country: 2015



NOTES: Only countries with more than 500 patent families in 2015 are included.
 SOURCE: Analysis of PATSTAT 2018, Spring edition.

The UK also has advantages when it comes to innovating in many key technological areas such as clean technology and life sciences which are set to become more important in the future. Understanding how the UK’s specialisms have changed over time, as we will explore in the next section, will help reveal how durable they are.

Section 3

Could the UK easily change its advantages?

Understanding how the UK's specialisms have changed over time has important implications for an economic strategy: the speed at which they have changed informs the extent which a strategy can attempt to change them.

Historically the UK's specialisms have not generally changed quickly over time. For example, the UK's strength in services was present in 1980, before the rapid deindustrialisation of the economy was complete, although it did increase sharply from the late 1990s, and peaked around the time of the financial crisis. Importantly, this stickiness or 'persistence' in specialisms does not appear to be merely a product of the UK's recent economic stagnation. Similar levels of persistence are seen more broadly amongst other OECD countries, with a country's RCA in a product ten or even thirty years ago being a good predictor of that country's RCA today.

Although an economy's strengths are persistent, this does not mean that they are immutable. Given the UK's current mix of goods specialisation, there are several product areas where it is currently not a large exporter in which it could grow its presence: these include products across several machinery and pharmaceuticals categories.

In this section, we examine the extent to which the UK's pattern of comparative advantages persist over time, looking both at the aggregated level of goods versus services as well as across specific product categories; we also look at the persistence of the UK's advantages in innovation across different technology classes.

We do this because understanding how the UK's specialisms have changed over time has important implications for an economic strategy: the speed at which they have changed informs the extent to which a strategy can attempt to change them. If RCA changes quickly, for example, then policy makers should not fixate too much on current industrial strengths, given that they are likely to change anyway. However, if RCA has been relatively stable over time, then policy should not approach the coming changes in the 2020s as if the country were a blank sheet of paper. Rather, a better policy option might be to build on and nurture the comparative advantages in goods and services that are strategic, and present future growth opportunities.

Having considered the extent to which we might expect current advantages to persist, we also consider areas of opportunity for the UK, using the UK's current mix of exports to identify where the UK could grow exports in the future.

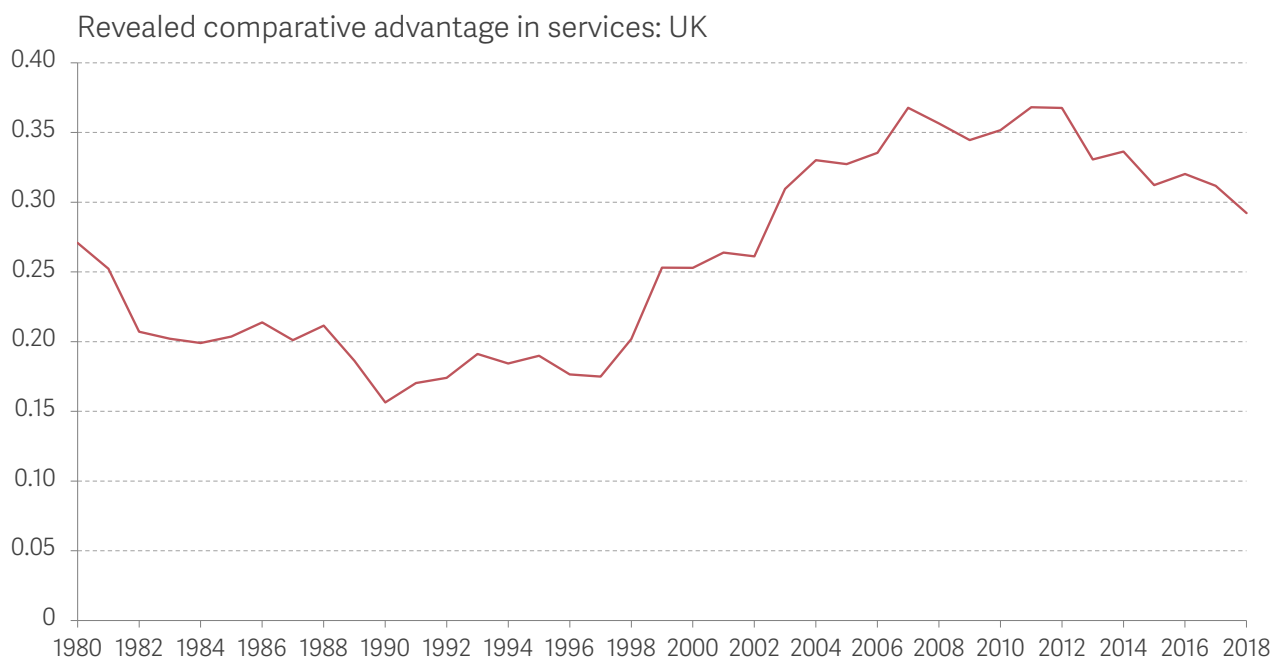
The UK's overall specialisation in services is longstanding, though it grew rapidly in the late 1990s and 2000s

We showed in Section 2 that the UK currently has an RCA in services. But looking back at how this has evolved over time reveals that, despite the narrative of the de-industrialisation of the 1980s radically altering the UK economy, the UK has had this advantage for a long time.

Figure 12 shows that the UK's large positive RCA in services has persisted since (at least) 1980, well before the rapid deindustrialisation of the economy was complete.²¹ Although this specialisation did increase sharply from the late 1990s, peaking around the time of the financial crisis, the services tilt of the economy is clearly a long-standing one, and not simply the product of the past few decades.

²¹ This shows the UK's share of services exports to the equivalent global share: see Box 1 in Section 2 for more detail.

FIGURE 12: The UK had a high revealed comparative advantage in services even before deindustrialising



SOURCE: Analysis of Harvard Growth Lab, Atlas of Economic Complexity (SITC version). RCA computed for just two categories of products: goods and services.

The UK's current strengths are similar to those of recent decades

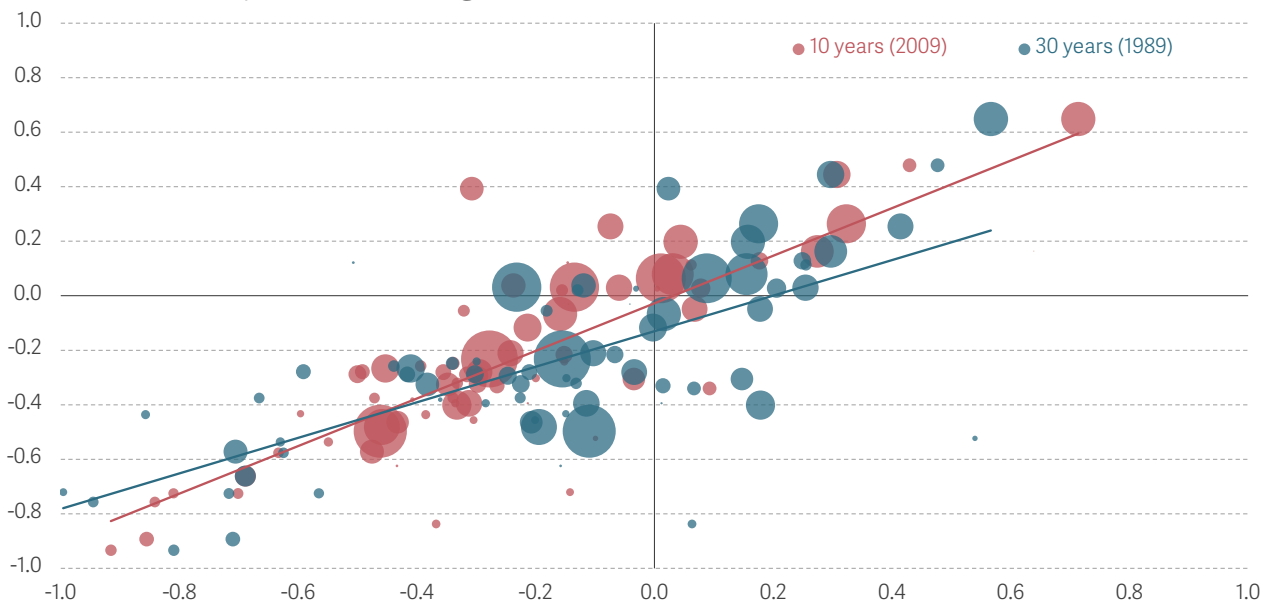
Looking at a more disaggregated set of goods and services demonstrates that this persistence has been a characteristic of the UK economy for the last 30 years. Figure 13 compares the UK's RCA in individual product categories in 2019 with their corresponding RCAs in 2009, and in 1989. The extent to which the bubbles (which correspond to different product categories) cluster around the forty-five-degree line reveals the extent of persistence in product-level RCA. It therefore appears that the UK's strengths are quite stable over time, and this is especially true over the last decade (as indicated by the steepness of the red line relative to the blue line and the closer fit of the bubbles to this line).

It is possible that this persistence reflects something peculiar to the UK, which has experienced declining levels of economic change during the past decade of stagnant living standards and productivity.²² But looking globally the analysis shows that this persistence is in fact very common, and that the UK's comparative advantages do not stand out as particularly 'sticky' over time.

²² N Cominetti, R Costa, A Eyles, T Moev & G Ventura, *Changing jobs?: Change in the UK labour market and the role of worker mobility*, The Economy 2030 Inquiry, May 2021.

FIGURE 13: The UK's set of comparative advantages is quite persistent over time

Product-level revealed comparative advantage in 2019 and 10- and 30-year lagged revealed comparative advantages: UK



NOTES: The size of the bubble represents the product's share in world trade in 2019. The lines represent the unweighted lines of best fit for the 10-year (red) and 30-year (blue) relationships, respectively (weighting makes little difference to these relationships).

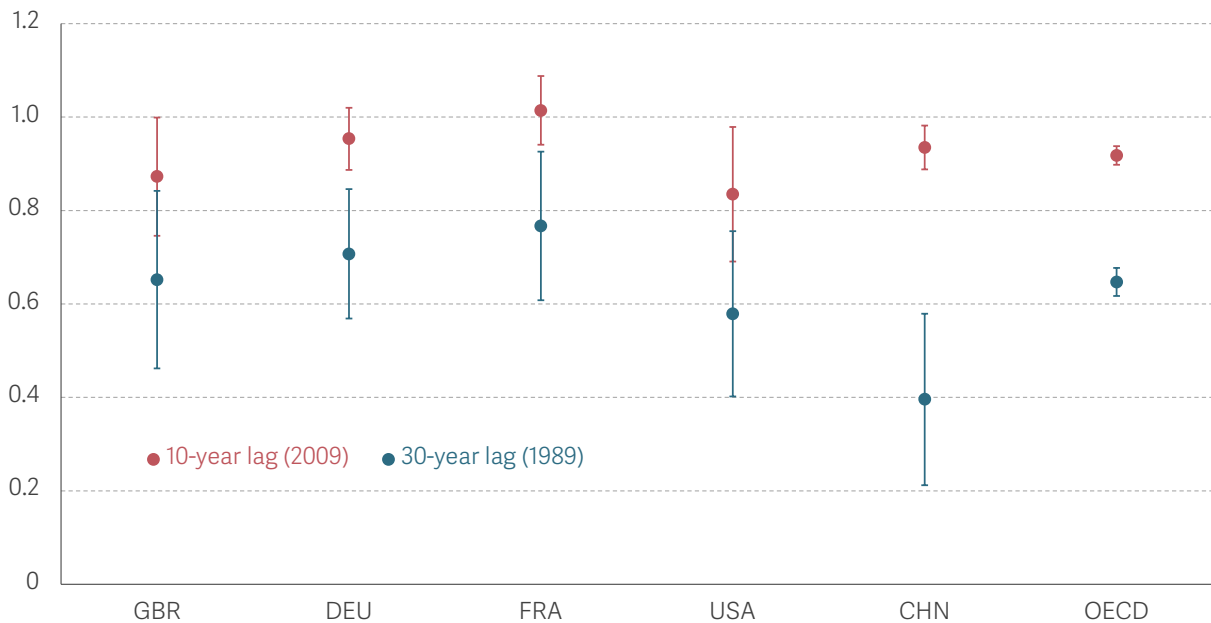
SOURCE: Analysis of Harvard Growth Lab, Atlas of Economic Complexity (SITC version).

Figure 14 charts the relationship between a country's set of RCAs across all product categories today and its RCAs 10 years ago and 30 years ago. It demonstrates that the persistence of the UK's mix of specialisations is comparable to that of the US, Germany and France.²³ It also shows that persistence has been high in China over the past decade too, but not so much over a 30-year period, a period covering its major economic transformation and its opening up to international trade. So, although RCAs can change over time, those of developed economies are fairly static.

²³ It shows the coefficients of a regression of a nation's current RCA with its 10-year and 30-year lags.

FIGURE 14: The persistence in the UK's comparative advantages does not stand out among peer countries

10-year and 30-year persistence in revealed comparative advantage by country: 2019

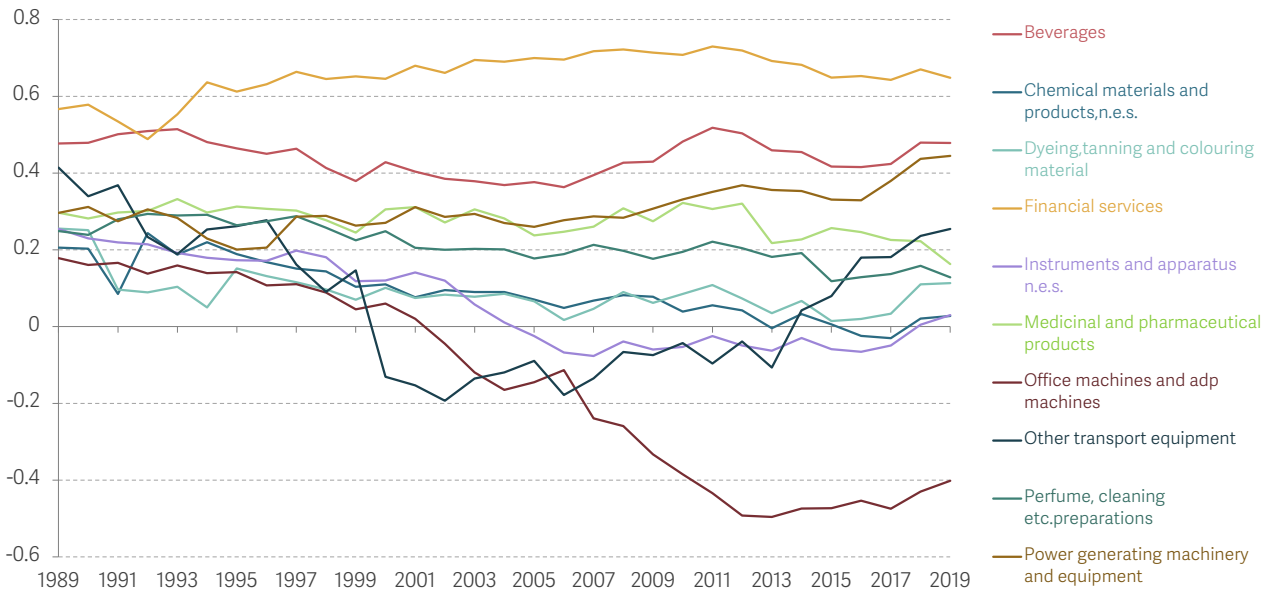


NOTES: Unweighted regression coefficients of RCA in 2019 against RCA in 2009 and 1989, respectively, for each country or group of countries as labelled. Vertical lines reflect confidence intervals of 95 per cent.
SOURCE: Analysis of Harvard Growth Lab, Atlas of Economic Complexity (SITC version).

We also find that ranking of the goods and services in which the UK has advantages in remains fairly static over time. Figure 15 demonstrates that the product categories in which the UK had the highest comparative advantage in in 2019 were also those in which it was the most specialised in 1989. Of the top 10 products in which the UK was most specialised in 1989, seven were also in our top 10 in 2019, and the top two then – financial services and beverages – are still the top two now. Figure 16 shows this also holds true for many of the areas in which the UK was specialised in in 1989 (exceptions include a decline in specialisation in “office machines”, and an increase in specialisation in “animal oils and fats”).

FIGURE 15: The UK has tended to retain advantage in products over time

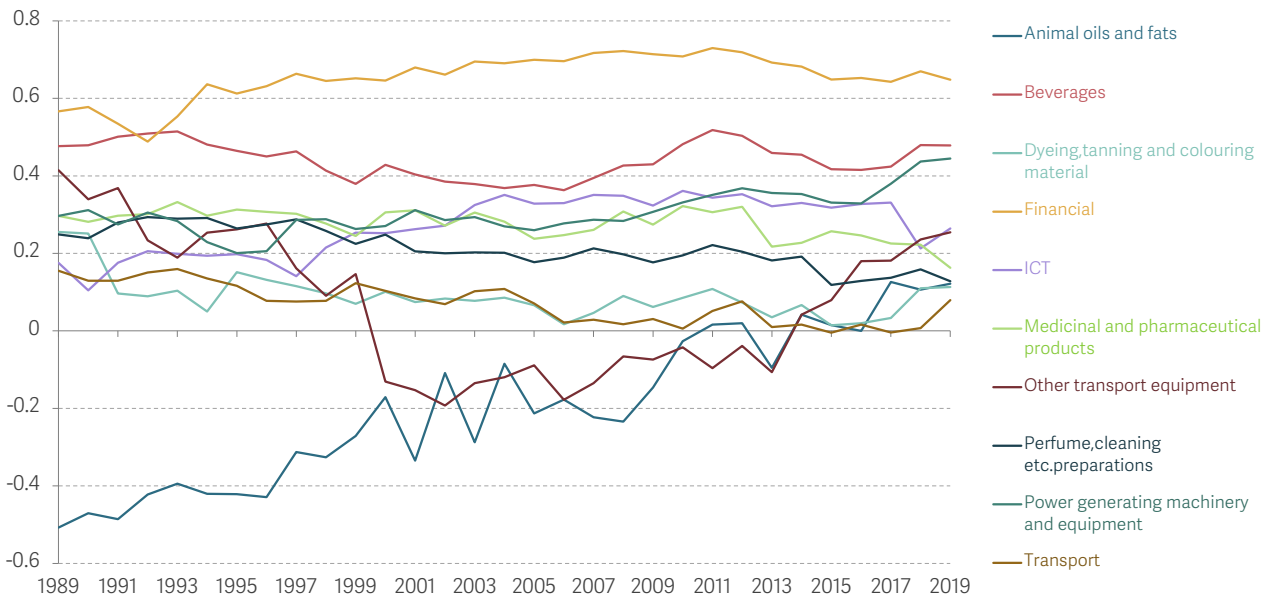
Evolution of revealed comparative advantage in top ten products of 1989: UK



NOTES: The following products were dropped: "Coin, including gold coin, proof and presentation sets, and current coin" and "coin (not gold coin or legal)".
SOURCE: Analysis of Harvard Growth Lab, Atlas of Economic Complexity (SITC version).

FIGURE 16: The UK's current advantages have existed for many decades

Evolution of revealed comparative advantage in top ten products of 2019: UK



NOTES: In the 2019 panel, three highly volatile products were dropped from the ranking: "Gold, non-monetary", "Miscellaneous manufactured articles, n.e.c.", "Coin (not gold coin or legal)". In the 1989 panel, the following products were dropped: "Coin, including gold coin, proof and presentation sets, and current coin" and "coin (not gold coin or legal)".
SOURCE: Analysis of Harvard Growth Lab, Atlas of Economic Complexity (SITC version).

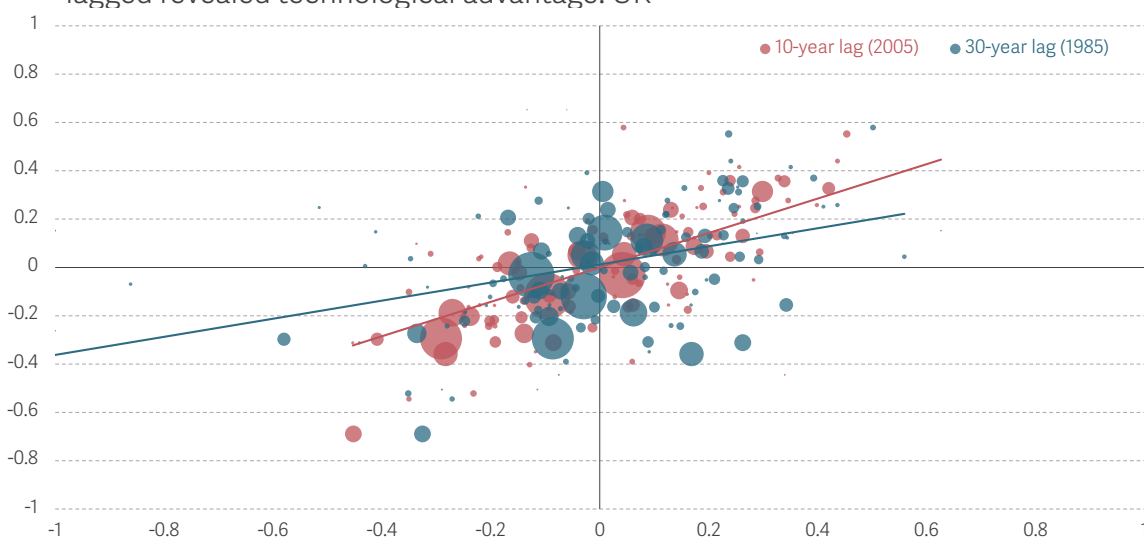
As discussed in Box 1, the SITC version of the trade data has the advantage of providing a longer time-series (going back to the 1960s for goods, and the late 1980s for services), but the product categorisation is less detailed. As a result, a disaggregation of more contemporary segments, e.g. “electronics”, would not appear in the data. Despite this data limitation, the finding that RCAs have a strong persistence over time is consistent with the broader literature on persistence and path dependence, which argues that history has an enduring influence on a country’s strengths and weaknesses.²⁴ Indeed, there are many reasons to suppose that RCA should be stable over time: if there are learning-by-doing effects, or technology transfers from exporting in an industry, then exporting industries should become relatively more efficient over time.²⁵ Furthermore, some comparative advantages stem from fundamental characteristics of an economy, such as human, physical and organisational capital, financial and legal institutions, and particular businesses located in the country, which are generally persistent over time.

The UK’s technological advantages are also fairly persistent over time

Analogously to the analysis above, we can also look at the persistence of technological advantages. As with traded goods, there appears to be persistence in RTA, although, unsurprisingly, this weakens over longer time periods (see Figure 17).

FIGURE 17: UK’s persistence in RTA is stronger over shorter periods

Revealed technological advantage by technology category in 2015, and 10- and 30-year lagged revealed technological advantage: UK



NOTES: 3-D printing and Micro-structures/Nanotechnology are not included as there were no innovations in these categories in 1985. The lines represent the unweighted lines of best fit for the 10-year (red) and 30-year (blue) relationships, respectively (weighting makes little difference to these relationships).

SOURCE: Analysis of PATSTAT 2018, Spring edition

²⁴ See: H-J Voth, *Persistence: Myth and Mystery*, CEPR Discussion Paper, 2020.

²⁵ J Proudman and S Redding, *Productivity Convergence and International Openness*, Bank of England Working Paper No.77, 1998, discusses this and provides evidence that for UK manufacturing sectors between 1970 and 1993 there was considerable mobility in specialisation over time and that the UK was more mobile in its specialisation than Germany. And previous evidence suggests that trade increases technology adoption in an industry; see: G Cameron, J Proudman & S Redding, *Technological convergence, R&D, trade and productivity growth*, *European Economic Review*, 2005.

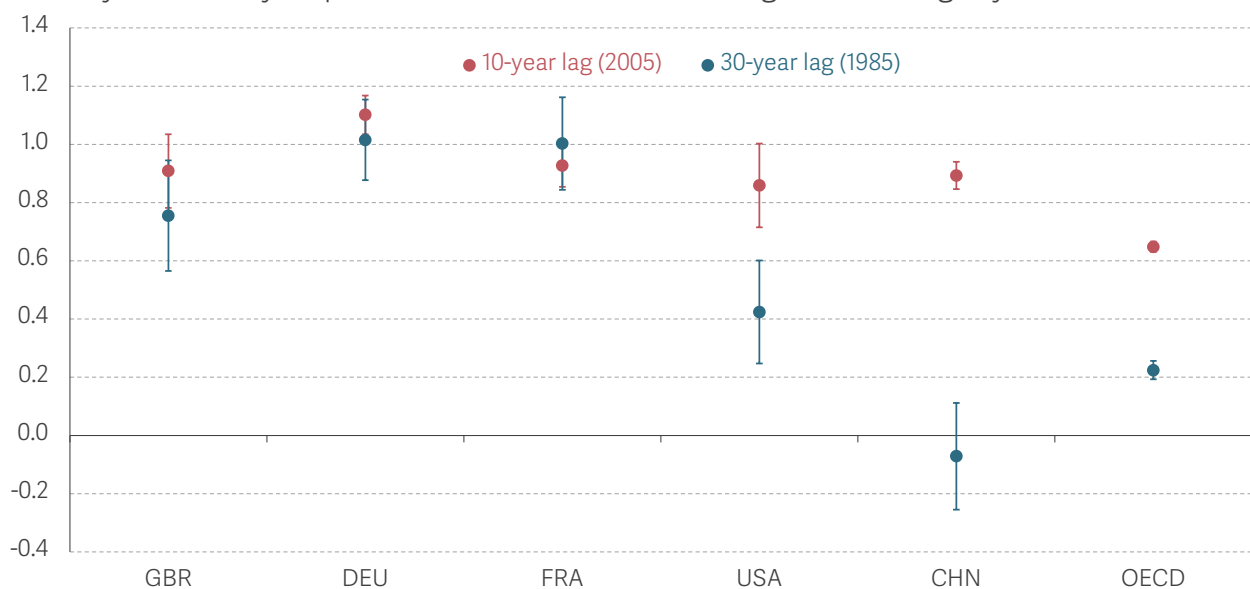
For example, of the twenty top CPC classes that the UK had RTA in in 1985 (including tobacco, bookbinding, travelling articles, and ships) ten remain in the top twenty in 2015. Meanwhile thirteen of the top twenty technology classes in 2005 remain in the top twenty in 2015 — including drilling, water supply and sewerage, aviation and organic chemistry.

As with RCAs, the UK is not alone in having fairly sticky RTAs: it has similar levels of persistence found in as France and Germany (see Figure 18).

The persistence of a nation's RTA is determined by two things: changes (or lack of) within a country, and the development of frontier technology. The former of these factors explains the lack of persistence in the 30-year lag of Chinese patenting, and the latter could explain why the US appears to have less persistence over the longer term: it has more successfully seized the opportunities offered by emerging technologies. The UK's RTA is a little less persistent over the longer term than that of Germany and France, and this suggests that either the UK has also done a good job of adapting to change, or that (given the low overall levels of patenting in the UK) new technology has outcompeted the innovation that the UK previously specialised in.

FIGURE 18: The UK's persistence in RTA is similar to that of many other developed countries

10-year and 30-year persistence in Revealed Technological Advantage by nation: 2015



NOTES: Unweighted regression coefficients of RTA in 2015 against RTA in 2005 and 1985, respectively, for each country or group of countries as labelled. Vertical lines reflect confidence intervals of 95 per cent. 3-D printing and Micro-structures/Nanotechnology are not included as there were no innovations in these categories in 1985.

SOURCE: Analysis of PATSTAT 2018, Spring Edition.

Given its existing specialisation, the UK has opportunities in several chemical and machinery product categories

Given the persistence of the UK's advantages, a renewed economic strategy cannot ignore the UK's history and current endowments: it needs to build on these existing areas of strength. However, while the UK's specialisms are persistent, they are not immutable. A successful strategy needs to explore the opportunity of increasing the export of goods and services which are 'close' to our existing exports, in the sense that they require similar capabilities to produce. It also means prioritising those close categories which offer the greatest opportunity for increasing the value of the UK's total export mix.

Figure 19 therefore shows where these opportunities may lie.²⁶ It looks at all goods categories in which the UK does not currently have a positive RCA (excluding those related to minerals and oil, which are reliant on natural geological endowments), and plots three things:

- the global export value of the good represented by the size of the bubble;
- a measure of 'distance' from the UK's current export mix (so a low value means that the goods should be relatively easy to produce) shown on the horizontal axis; and,
- the 'opportunity gain' - a measure of the strategic value of a product based on the paths it opens to exporting more complex products - on the vertical axis.²⁷

The analysis shows that the UK's existing capabilities offer opportunities in some relatively complex chemicals and machinery categories — these include relatively small categories such as the production of enzymes and pharmaceutical goods (which is a category mainly containing sterile surgical textiles) as well as the larger categories of motor vehicle parts, medical equipment and spacecraft. Importantly, the downward slope reveals that the goods closest to the UK's current mix (i.e. those with a low distance value on the left of the chart) open up paths to more complex and high value goods (i.e. they have a high opportunity gain).²⁸ Successfully exploiting the opportunities from nearby goods would therefore offer the UK the potential to export in more high-growth goods category areas.

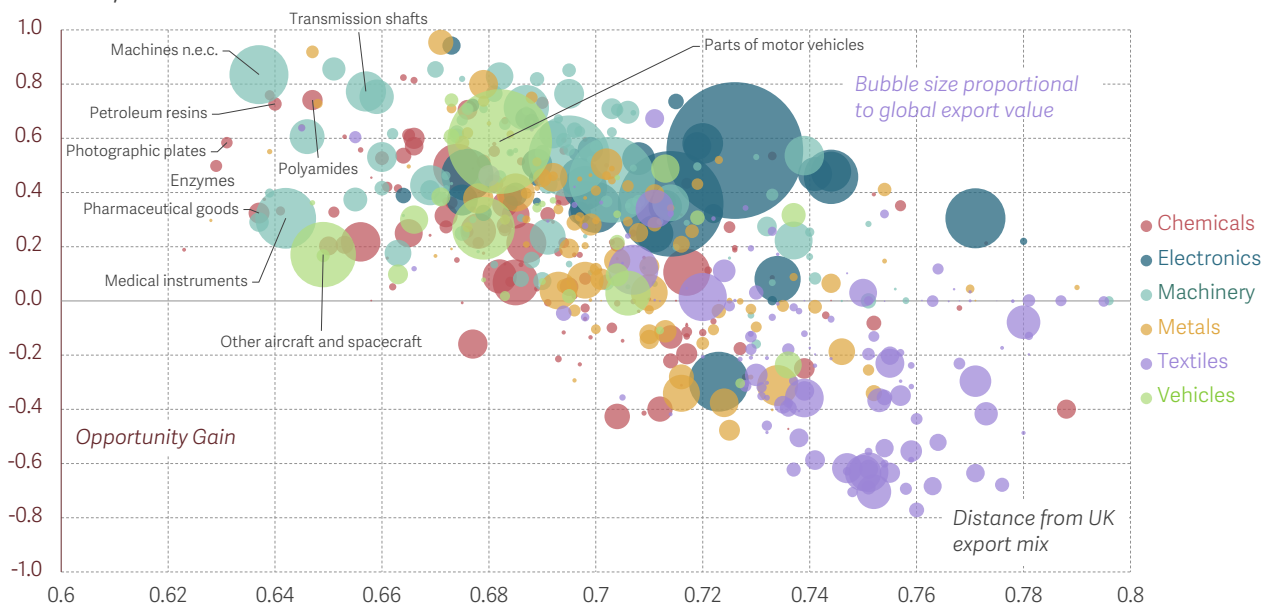
²⁶ The analysis in this paper has largely used 2-digit HS and SITC codes as the level of goods aggregation, the data used in this section is calculated by the Harvard Growth Lab and uses 4-digit HS codes to identify more fine-grained areas in which the UK could develop export specialisms in.

²⁷ Products which have a closer proximity (i.e. they tend to be exported together) to more complex goods will have a higher opportunity gain). For more information on this measure see R Hausmann et al., *The Atlas of Economic Complexity: Mapping Paths to Prosperity*, 2013.

²⁸ For more on how "product complexity" captures differences in growth potential see S Unsworth et al., *Jobs for a strong and sustainable recovery from Covid-19*, LSE Centre for Economics Performance, October 2020.

FIGURE 19: The UK's export mix provides opportunities to specialise in goods which open new up links to more complex products

Goods product categories by distance from current export mix and 'opportunity gain': UK, 2019



NOTES: Pharmaceutical goods refers to a subset of the HS 2-digit Pharmaceutical Products category studied earlier in this report, and includes sterile surgical textiles as well as chemical contraceptives.
SOURCE: Analysis of Harvard Growth Lab, Atlas of Complexity.

The above analysis focusses on goods where exports could be grown, but there are also some opportunities to grow in key services categories. The telecommunications, computer and information services category, for example, is a large part of global trade, amounting to 3.5 per cent of all global exports, and has been growing at 8 per cent per year for the past decade. In recent years, the UK's RCA in this category has been declining – perhaps reflecting the UK's ongoing weakness, as revealed by our low RTA in areas such as software and IT methods. However, this is a category that also includes information services, which should be an area of strength for the UK given its strong media landscape and ecosystem of creative industries.

This section has shown that the UK's advantages have been fairly persistent over the past thirty years, and that this persistence has been shared by most developed economies around the world – indicating that it is not a product of economic stagnation in the UK, but the result of path dependency in a country's economic structure. However, even while accepting an element of path dependency to the nation's specialisms, an economic strategy can still exploit opportunities in new areas of adjacent goods, and the UK's opportunities may lie in areas such as the production of enzymes and the large category of motor vehicle parts, but also in telecommunications, computer and information services.

Section 4

What are the prospects for the UK's current key specialisms?

This Section focuses on three key areas of UK specialisation – finance and business services, creative industries and pharmaceuticals – setting out where the UK's advantage has come from, and analysing future prospects.

Each of these specialisms is in an area where global exports are growing, and where the UK's specialisation is longstanding. All of these rely on a highly educated and innovative workforce, and international openness to talent and ideas. In the case of finance and business services, UK specialisation reflects London's role as an international financial centre. The UK's creative strengths generate significant economic and broader "soft power" gains and can be traced to cultural openness, high-quality creative education and – in media – the role of public service broadcasting shaping the market. Pharmaceuticals draws on and contributes to the UK's strong science base. All of these sectors tend to involve geographically-concentrated economic activity, often centred around London and the South East. A common source of strength – as it is for all knowledge-intensive sectors – is the UK's university system, which includes world-class universities across several disciplines, and a disproportionate share of high-quality academic research.

Changes this decade bring with them new risks and opportunities for these areas. Brexit brings new risks to trade in services and access to international talent, of particular concern in finance and related industries, and the creative sectors. Uncertainty over regulatory issues and research funding are impacting on pharmaceuticals. The development of vaccines and treatments during the pandemic has highlighted the UK's strengths in pharmaceuticals and life sciences and the key role of related research taking place in British universities, but the pandemic has placed parts of the creative industries (particularly those involving live performances

and events) under significant strain. Finally, net zero brings with it new opportunities in 'green' financial services. It will be crucial to manage these changes in a way that maximises the chances that the UK can retain and build strengths in growth areas, and ensure that the gains of such growth are shared more widely across society.

Sections 2 and 3 showed that there are a number of areas where the UK has long had a comparative advantage; this Section provides more detail and context on three key areas in which the UK is specialised, and where global trade volumes are growing: financial and business services, creative industries, and pharmaceuticals. In each of these areas, deep-rooted characteristics and capabilities of the UK help to explain its comparative strengths. But more detailed analysis reveals some areas where the UK's specialisation has been in decline in recent years. Understanding these features, and new risks or opportunities that might arise due to change this decade, is important for informing a new economic strategy for the UK.

Financial and business services

As we saw in Section 2, finance, insurance and pensions, and other business services (such as law, accounting, consulting, research and development services) are all areas where the UK has long had comparative advantage in trade. In 2019 they accounted for nearly 30 per cent of the UK's exports, about double the share in the US and France, and more than three times the share in Germany, and this difference has existed since (at least) 2005 (see Figure 20).

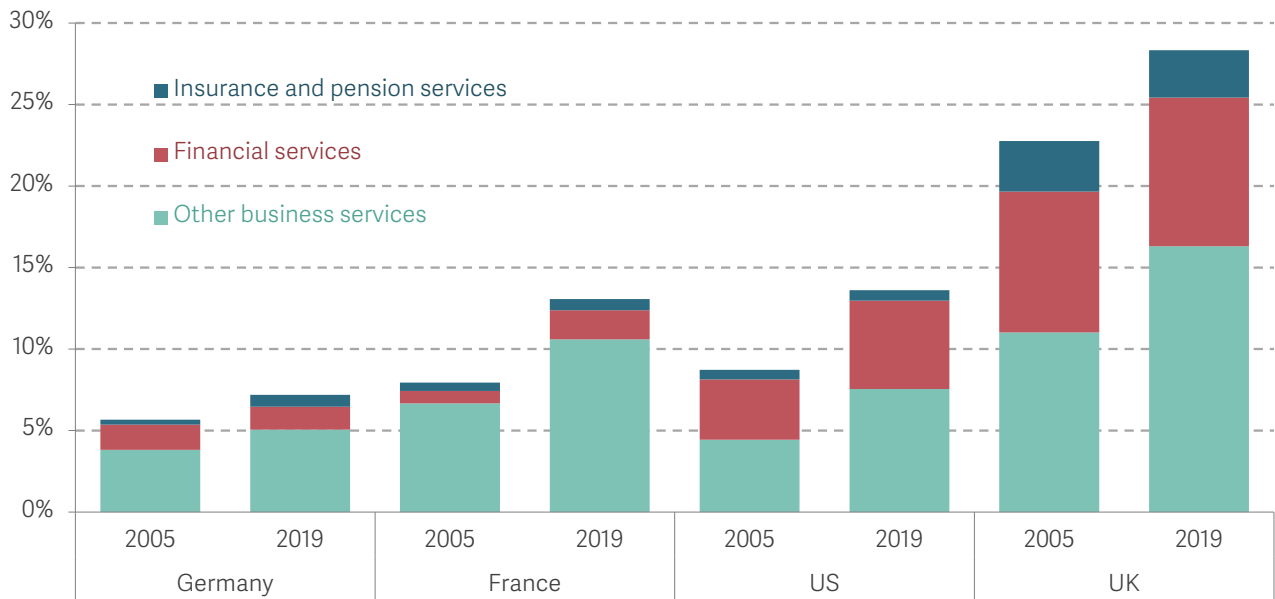
Of these three service categories, it is 'other business services' that makes up the highest share of exports, and that has experienced the highest growth. This rise is largely due to the fact that business services are one of the fastest-growing products in global trade, rather than from an increased specialisation of the UK in this area. In fact, the UK's specialisation in business services has been relatively stable since the early 2000s, as Figure 20 shows.

Amongst advanced economies, we find that only five countries have revealed comparative advantage in financial services in 2019; of these, the UK ranks fourth, behind Luxembourg, Switzerland and Hong Kong (see Figure 21).²⁹ There are six countries with a comparative advantage in insurance and pension services; here, the UK is second to Switzerland. There are a greater number of advanced economies with an RCA in other business services (eleven in total), but, again, the UK has one of the highest RCAs in this group.

²⁹ Here, we define 'advanced economies' as the OECD plus Hong Kong and China.

FIGURE 20: Other business services account for a large and growing share of UK exports

Sector shares in total exports, by country: 2005 and 2019



NOTES: Share of total exports accounted for by service sectors as labelled.

SOURCE: Analysis of Harvard Growth Lab, Atlas of Economic Complexity (HS version); OECD-WTO, Balanced Trade in Services.

FIGURE 21: Amongst advanced economies, the UK is the third-most specialised in finance

Revealed comparative advantage in financial services, insurance and pension services, other business services, by top five countries: 2019

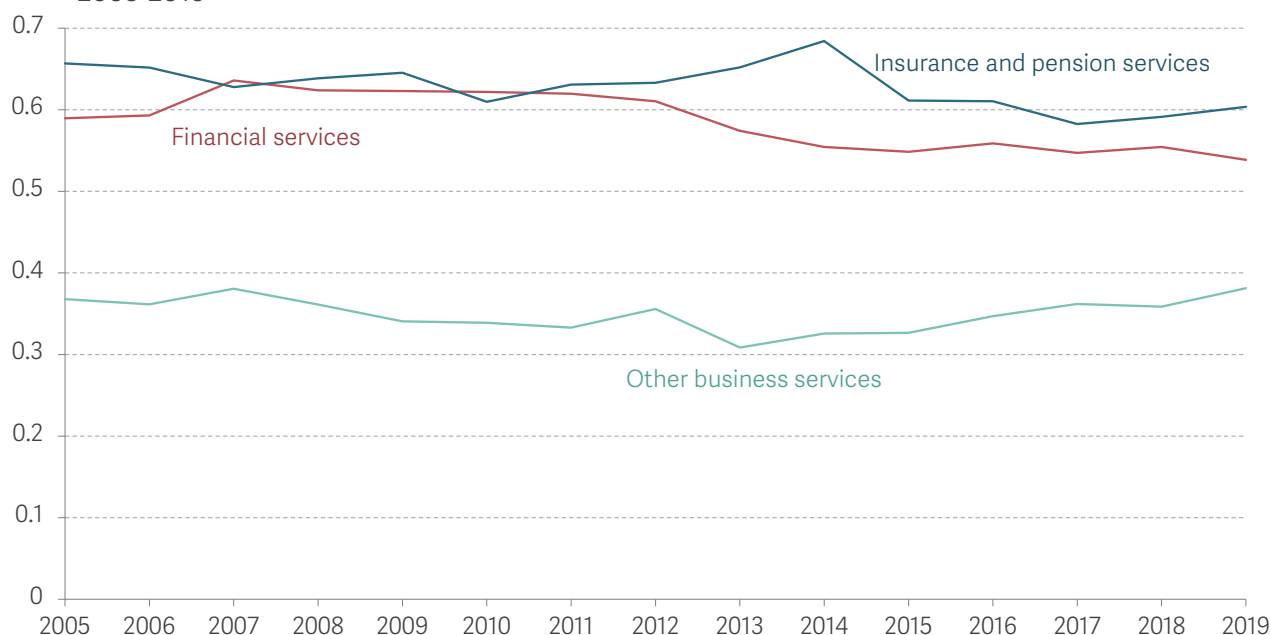


NOTES: Plot of top 5 countries by RCA. RCA calculated using global trade, but bar chart restricted to OECD countries as well as China and Hong Kong.

SOURCE: Analysis of Harvard Growth Lab, Atlas of Economic Complexity (HS version); OECD-WTO, Balanced Trade in Services.

FIGURE 22: The UK's comparative advantages in finance and business services are longstanding

Revealed comparative advantage across finance and related business services: UK, 2005-2019



SOURCE: Analysis of Harvard Growth Lab, Atlas of Economic Complexity (HS version); OECD-WTO, Balanced Trade in Services.

Figure 22 shows that the UK's specialisation across these sectors has been fairly persistent, with perhaps some evidence of a decline since the early 2010s for finance, insurance and pension services, and a slight rise in other business services.

The UK's export strengths in these areas are reflected in their relatively high contribution to output. Finance and insurance accounted for 8.3 per cent of the UK's GVA in 2021, the third highest among OECD countries (after Luxembourg and Switzerland).³⁰ This share grew in the 2000s in the run up to the financial crisis, but has been relatively steady since. Professional, scientific and support activities made up 12.5 per cent of the UK's GVA in 2021, placing the UK fifth among OECD countries.³¹

The UK's national strength in finance and related business services is driven by London's status as an international financial centre. London's role in international finance has long historical roots, with the development of its banking sector during the Industrial Revolution, and as a centre for finance and trade during the British Empire. But it was the UK's deregulation of the stock market in 1986 (known as the "Big Bang") which led to the City's rapid growth and it taking up the position as the global financial capital, offering services including international banking and capital markets, asset management,

³⁰ Source: OECD, [Value added by activity](#), accessed 22 March 2022.

³¹ Research using a more detailed mapping of professional and business services estimates that over the period 1998-2017, these sectors made up 18 per cent of value added. See: M Douch et al., [Ten Facts About the UK Professional and Business Services Sectors and Their International Traders](#), Aston Business School, July 2020.

insurance, as well as a range of complementary professional and business services that have grown around the core financial institutions.³²

The enduring strength of London as an international financial centre has been attributed to a number of persistent features, including the supply of human capital, international openness, a favourable tax regime, and the English language and legal system. These features have attracted firms and allowed self-reinforcing agglomeration economies to build over a long period.³³ Although much of the economic activity in finance and business services is still concentrated in London, other parts of the UK also specialise (in employment terms) in finance (for example, support activities) and professional services.³⁴

How might these advantages change in the future? The Global Financial Centres Index compares the overall competitiveness (across business environment, human capital, infrastructure, development of the financial sector and reputation) of the world's leading financial centres and up until 2018, London was in first place.³⁵ More recently, London has moved into second place after New York, losing ground across the different dimensions. Nevertheless, London leads in areas which are likely to grow in importance over this decade and beyond, recently ranked as a leader in fintech³⁶ and green finance.³⁷

Some jobs and business have been lost to other financial centres as a result of Brexit. The UK government had hoped to negotiate a bespoke agreement on financial services, but leaving the EU Single Market meant that 'passporting' rights were replaced with 'equivalence'.³⁸ It appears that Covid-19 prevented some adjustment, and more movement is likely as borders reopen.³⁹ So far, financial and business services do not appear to be a priority of the UK's post-Brexit economic strategy.⁴⁰ Liberalising services is notoriously difficult, and the UK's largest individual trading partner in services, the US, is not engaging in negotiations on a future agreement. The Government's own analysis predicts that a trade agreement with India would lead to business services comprising a smaller share of UK gross value added, although the deal could present significant long-term benefits to UK services exporters.⁴¹ There has been a post-Brexit move towards

³² There are high levels of intermediate consumption between these two industries. See: R Riley et al., [Professional & Business Services sector: Creating further demand and growth outside London](#), Department for Business, Energy and Industrial Strategy, February 2020.

³³ Bank of England, [Quarterly Bulletin 1989 Q4: London as an international financial centre](#), December 1989.

³⁴ S Bernick, R Davies & A Valero, [Industry in Britain – An Atlas](#), Centre for Economic Performance, September 2017.

³⁵ Z/Yen Partners and China Development Institute, [The Global Financial Centres Index 23](#), March 2018.

³⁶ The recent Findexable global fintech ranking places London second, after San Francisco Bay. See Findexable, [Global Fintech Rankings Report: Bridging the Gap](#), June 2021 (<https://findexable.com>).

³⁷ The Global Green Finance Index 8, published by Long Finance & Financial Centre Futures puts London in first place, see Z/Yen, [The Global Green Finance Index 8](#), October 2021.

³⁸ These enable firms to trade freely in EU or EEA states, and are the foundation of the EU single market for financial services. In comparison with passporting, equivalence offers limited access to the single market.

³⁹ See, for example: H Thomas, [Brexit is a slow bleed for the City of London](#), Financial Times, November 2021.

⁴⁰ J De Lyon et al. [Trading places: Brexit and the path to longer-term improvements in living standards](#), Resolution Foundation, October 2021.

⁴¹ S Hale, [A presage to India: Assessing the UK's new Indo-Pacific trade focus](#), Resolution Foundation, January 2022.

financial regulators having the objective to consider ‘competitiveness’ when setting rules,⁴² even though the experience of the global financial crisis points to the risks in this type of approach.⁴³ Yet, as discussed above, the UK has institutional and historical strengths that lend itself to being a financial and business services powerhouse.

Creative industries

The UK’s creative industries play an important role in the economic and cultural life of the country, and also contribute to its success on the global stage.⁴⁴ As a policy concept, the ‘creative industries’ date back to at least the late 1990s, when the newly elected Labour government established the Department for Culture, Media and Sport, and the Creative Industries Task Force which set about mapping relevant activities.⁴⁵ Today’s definition of the creative industries includes advertising and marketing; architecture; crafts; design and designer fashion; film, TV, video and photography; IT, software and computer services; publishing; museums, galleries and libraries; and music, performing and visual arts.⁴⁶

Classifications of services trade in the international data do not correspond to this definition of the creative industries.⁴⁷ Nevertheless, three categories in the services trade data can help shed light on the UK’s comparative advantages in a subset of creative industries. These are:

- personal, cultural and recreational services, which comprises audio-visual and related services, other personal, cultural and recreational services (but also some education, health and other services which are not in the DCMS list);⁴⁸
- telecommunications, computer and information services (“ICT”); and,

⁴² HM Treasury, [Financial Services Future: Regulatory Framework Review](#), November 2021.

⁴³ These are highlighted by a speech by Andrew Bailey, now governor of the Bank of England, and at the time, head of the Financial Conduct Authority. See: A Bailey, [The future of financial conduct regulation](#), April 2019.

⁴⁴ J Gross, [The Birth of the Creative Industries Revisited: An Oral History of the 1998 DCMS Mapping Document](#), King’s College London, 2020.

⁴⁵ Department for Digital, Culture, Media and Sport, [The UK Creative Industries Mapping Document](#), April 2001.

⁴⁶ See: Department for Digital, Culture, Media and Sport, [DCMS Sector National Economic Estimates](#), March 2022. Most of these sectors relate to services, but the manufacture of jewellery and related articles is included within “crafts”. Sectors are assigned to the creative industries when the share of creative occupations in them, according to census data, exceeds a certain threshold. Creative activities that are carried out in other parts of the economy are missed in these definitions (e.g. in house fashion designers in clothes manufacturers). For more detail, see Department for Digital, Culture, Media and Sport, [Creative Industries Economic Estimates Methodology](#), February 2016.

⁴⁷ For a broader discussion about challenges defining creative industries and making cross country comparisons, see: T Kemeny, M Nathan & D O’Brien, [Creative differences? Measuring creative economy employment in the United States and the UK](#), *Regional Studies* 54(3), 2020.

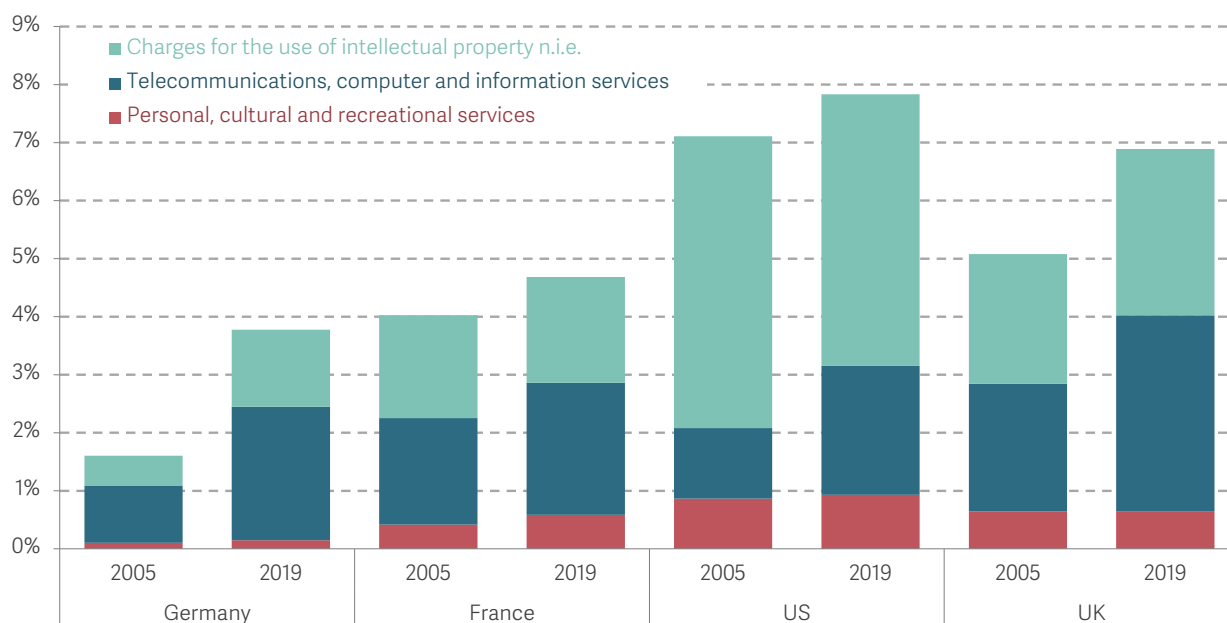
⁴⁸ Education and health services provided to non-residents who are present in the territory of the service provider are included in “travel” rather than this category. This means that the educational services included here relate to courses by correspondence, television or the internet or teachers providing services directly overseas. Details are set out in: International Monetary Fund, [Balance of Payments and International Investment Position Manual](#), November 2013.

- charges for the use of intellectual property (IP) not included elsewhere, which includes licences to reproduce or distribute audio-visual products and computer software, as well as some other categories which are not directly relevant for the creative sectors.⁴⁹

These three categories collectively account for a relatively high share of trade in the UK, second only to the US (see Figure 23). The UK has seen an increase in the share of exports accounted for by charges for the use of IP and ICT services.

FIGURE 23: Services related to creative sectors together account for a relatively high share of exports in the UK

Sector shares in total exports, by country: 2005 and 2019



NOTES: Share of total exports accounted for by service sectors as labelled (where n.i.e. stands for 'not included elsewhere').

SOURCE: Analysis of Harvard Growth Lab, Atlas of Economic Complexity (HS version); OECD-WTO, Balanced Trade in Services.

Among advanced economies, nine countries have RCA in personal, cultural and recreational services in 2019; of these, the UK ranks fourth, behind Luxembourg, the US and Sweden (see Figure 24). The UK ranks seventh out of ten countries with an RCA in intellectual property charges (Figure 25). In these data, the UK does not have comparative advantage in ICT services in 2019.⁵⁰ Trends in RCA since 2005 show that the UK has been specialised in ICT services but experienced a decline in the most recent

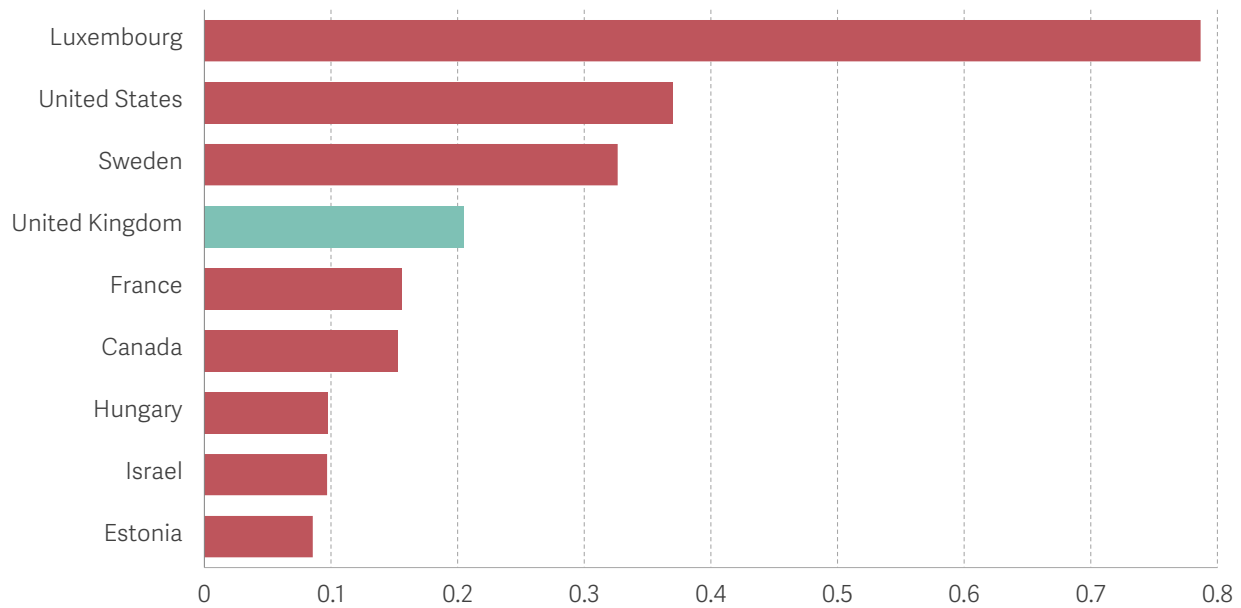
⁴⁹ More specifically: franchises and trademarks licensing fees and licences for the use of outcomes of research and development. Note that R&D services included within "other business services" includes the sale of property rights arising from R&D. For more detail, see: OECD, *Extended Balance of Payment Services classification (EBOPS 2010)*, accessed March 2022.

⁵⁰ The countries that are specialised in these areas (not shown here) are Ireland, Israel, Finland, Sweden, Costa Rica, Latvia and Estonia.

years (see Figure 26).⁵¹ Therefore, the increase in the share of ICT to total UK exports is driven by growth in global exports in this area, as opposed to any increase in the UK's related specialisation. By contrast, specialisation in IP charges appears to have risen in recent years.

FIGURE 24: The UK is one of the most specialised in personal, cultural and recreational services

Revealed comparative advantage in personal, cultural and recreational services, by country: 2019



NOTES: RCA calculated using global trade, but bar chart restricted to OECD countries as well as China and Hong Kong.

SOURCE: Analysis of Harvard Growth Lab, Atlas of Economic Complexity (HS version); OECD-WTO, Balanced Trade in Services.

The economic importance of these sectors in terms of output (and exports) to the UK is highlighted when using the broader DCMS definition of the creative industries. These accounted for 6 per cent of UK GVA in 2019, and they have grown faster than the UK economy overall since 2011.⁵² Firm-level analyses find that a large share of businesses in the creative industries are involved in exporting:⁵³ UK services exports by businesses in the creative industries are estimated to be worth £41.4 billion in 2020 (14.2 per cent of UK service exports), and they also exported £8.9 billion of goods.⁵⁴

⁵¹ The longer-run data which form the basis of the analysis in Figure 17 and has a slightly different sample of countries shows a similar recent decline, though the UK still has RCA in ICT in 2019.

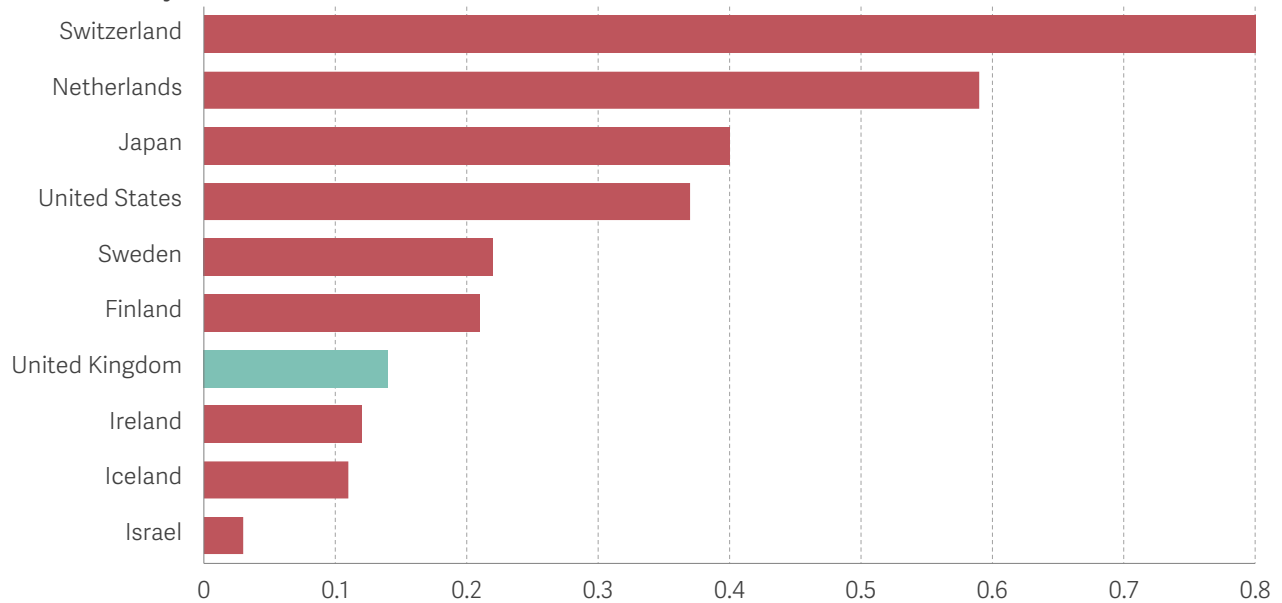
⁵² Department for Digital, Culture, Media and Sport, [DCMS Economic Estimates 2019 \(provisional\): Gross Value Added](#), February 2021.

⁵³ S Di Novo, G Fazio & S Maioli, [Creative firms and trade: some stylised facts from the CIC Access to Finance Survey](#), Newcastle University, November 2021.

⁵⁴ Department for Digital, Culture, Media and Sport, [DCMS Sectors Economic Estimates 2020: Trade headline release](#), March 2022.

FIGURE 25: The UK is specialised in charges for intellectual property

Revealed comparative advantage in charges for the use of intellectual property, by country: 2019

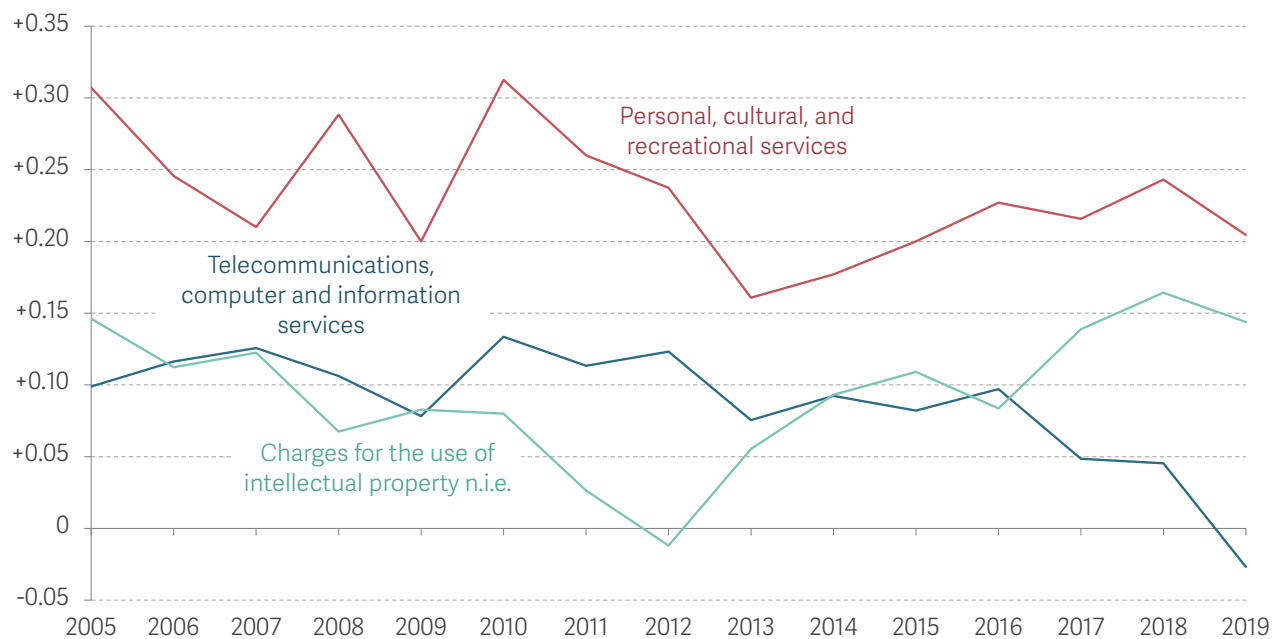


NOTES: RCA calculated using global trade, but bar chart restricted to OECD countries as well as China and Hong Kong.

SOURCE: Analysis of Harvard Growth Lab, Atlas of Economic Complexity (HS version); OECD-WTO, Balanced Trade in Services.

FIGURE 26: The UK has recently seen a decline in its specialisation in ICT services

Revealed comparative advantage across service sectors that are part of the “creative industries”: UK, 2005-2019



SOURCE: Analysis of Harvard Growth Lab, Atlas of Economic Complexity (HS version); OECD-WTO, Balanced Trade in Services.

On top of the measurable economic importance of creative industries in the UK, creativity itself makes a contribution across other parts of the economy, and these activities also have a (harder-to-measure) role to play via their contribution to the UK's "soft power".⁵⁵ An international ranking of soft power places the UK in second place overall in 2019, with particular strengths in culture (and education) sub-indices:

*"British art, film, music, and sport continue to hold enormous global appeal – from Ed Sheeran to Harry Potter and the Premier League – and tourism continues to flourish with its abundance of museums, galleries, and theatres."*⁵⁶

While it is difficult to measure the contribution of art and culture to soft power, and outcomes that can be attributed to this, explicit soft power interventions are pursued by governments internationally, including the UK's.⁵⁷

Creative industries tend to cluster heavily in cities.⁵⁸ In the UK, in employment terms, they tend to be concentrated in London and the South East⁵⁹ more so than finance.⁶⁰ However, there is specialisation in other parts of the country including Edinburgh and Greater Manchester, and microclusters of creative businesses are widespread.⁶¹ Creative clusters have also been found to generate large job multipliers.⁶²

Important contributors to the success of creative sectors include strengths in the UK's education and university system in relevant subjects (see Box 3) and – relatedly – the ability to attract and integrate culturally diverse creative professions.⁶³ In media, the UK's public service broadcasters have played an important role, providing content and formats that are popular internationally (due to both quality and language advantages). Both the BBC and Channel 4 are required to commission content from independent production companies, hence supporting SMEs and shaping media markets.⁶⁴

⁵⁵ Joseph Nye introduced the concept of soft power in the early 1990s. Soft power resources include cultural attraction, ideology and international institutions which are ways of "getting others to want what you want". See: J Nye, *Soft Power*, Foreign Policy 80, Autumn 1990.

⁵⁶ www.softpower30.com/country/united-kingdom/, (2019 overview for the UK), accessed 30 March 2022.

⁵⁷ See: J Doeser & M Nisbett, *The art of soft power*, King's College London. In the UK this includes a fund announced in 2017. See: ITV, *Boris Johnson to set up £700m 'empowerment fund' for British allies facing 'Russian aggression'*, February 2017.

⁵⁸ V Montalto, F Panella & P Sacco, *What does Brexit mean for UK cultural and creative cities?*, European Urban and Regional Studies 28(1), 2021.

⁵⁹ P Higgs, J Davies & H Bakhshi, *The geography of the UK's creative and high-tech economies*, Nesta, January 2015.

⁶⁰ S Bernick, R Davies & A Valero, *Industry in Britain – An Atlas*, Centre for Economic Performance, September 2017.

⁶¹ J Siepel et al., *Creative Industries Radar: Mapping the UK's creative clusters and microclusters*, Creative Industries Policy and Evidence Centre, November 2020.

⁶² In this context, a creative job multiplier is the number of other jobs generated in a local area by a creative job. See: D Gutierrez Posada et al., *Do creative industries generate multiplier effects? Evidence from UK cities 1997-2018*, Creative Industries Policy and Evidence Centre, July 2021.

⁶³ V Montalto, F Panella & P Sacco, *What does Brexit mean for UK cultural and creative cities?*, European Urban and Regional Studies 28(1), 2021.

⁶⁴ The BBC has quotas for commissioned versus in-house production, while Channel 4 commissions all content from independent production companies. The LSE Growth Commission discussed lessons for industrial policy from competitive publicly-funded procurement in the UK television sector, whereby government support has allowed the private sector to flourish.

The creative industries are an area of strategic focus for the UK Government, but maintaining strengths will require a consideration of the underlying characteristics that have contributed to them, and the likely impacts of wider policy changes, particularly given the challenges faced by certain creative sectors during the Covid-19 pandemic.⁶⁵ Potential changes to the BBC's funding model risk reducing UK-produced content and export opportunities (as well as the broader social value of public service broadcasting), and also pose an indirect risk to those parts of the private independent sector which rely on the BBC's commissions. Future skills challenges might arise due to changes in the UK's ability to attract and retain creative talent from overseas (the end of freedom of movement with the EU implies an increase in the administrative burden of performing artists that travel, for example), or via cuts in arts education in schools and universities, which could threaten the pipeline of homegrown creative talent.⁶⁶

BOX 3: The UK's universities

As producers of human capital, innovation, and as 'anchor institutions' across the UK's regions, universities play an important role in local and national economic growth, as well as in the development of the country's areas of comparative and technological advantages, many of which relate to high-skill and innovation-intense activities.⁶⁷

Current context, evolution and expansion

In 2018/19, there were 165 higher education institutions in the UK, with 2.4 million students enrolled in them.⁶⁸

Among these are institutions that excel globally, with four UK universities in the top 10 QS global universities rankings in 2022, and 16 in the top 100.⁶⁹ UK universities display excellence across disciplines: three of the top ten universities for engineering and technology are in the UK (Cambridge, Oxford and Imperial), as is the case for life sciences and medicine (Cambridge, Oxford and UCL) and economics (LSE, Oxford and Cambridge).⁷⁰ Globally, the top two universities in arts and design are British (Royal College of Art and University of the Arts London),

⁶⁵ See, for example: J Siepel et al., *Creative Radar 2021: The impact of Covid-19 on the UK's creative industries*, Creative Industries Policy and Evidence Centre, July 2021.

⁶⁶ See, for example: A Carlisle, *Arts cuts are false economies*, Times Higher Education, July 2021.

⁶⁷ For international analysis (including the UK) that links the establishment of universities to regional growth, see: A Valero & J Van Reenen, *The economic impact of universities: Evidence from across the globe*, Economics of Education Review 68, February 2019.

⁶⁸ Based on the number of institutions returning data to the Higher Education Statistics Authority (HESA). See: E Castell & D Wake, *Higher education in facts and figures: 2021*, Universities UK, 2022.

⁶⁹ Quacquarelli Symonds (QS) provides annual rankings of universities worldwide. For the 2022 rankings, see: *QS World University Ranking 2022*.

⁷⁰ For QS university rankings by subject, see: *QS World University Rankings by Subject 2021*.

with another in joint eighth place (The Glasgow School of Art).

The UK's university sector has a long tradition, dating back to the "ancient universities" (the first seven universities founded before 1800, of which Oxford was the first in 1096). A number of universities were chartered during industrialisation in the 1800s, followed by the "Red Brick" universities which were set up before the First World War. A large expansion occurred around the time of the influential Robbins Report into Higher Education (1963).⁷¹ Former polytechnics were converted to universities in 1992, and there have been more recent upgrades of higher education institutions to university status. At the same time, enrolments at existing universities have grown over time, and in recent years this happened via the lifting of 'caps' to the numbers of students that universities can recruit.⁷² From 2000 to 2020, the share of 25-34-year-olds with a degree has risen particularly rapidly in the UK compared to the OECD average, as well as compared with the US, France and Germany. In 2021, over 50 per cent of the adult population had been

educated at the tertiary level, up from 25 per cent in 2000.⁷³

There are differing opinions as to whether the university sector has reached an optimal size, or whether further growth would be economically beneficial to the UK or particular regions. The graduate wage premium holds strong on average – suggesting that there isn't an over-supply of graduates – but there is significant variation in the returns to a degree, both by university and subject.⁷⁴ There is also a need to improve technical and vocational education alternatives (and a future Economy 2030 paper will consider these issues in more detail).

International openness

The UK ranks fourth, after Luxembourg, Australia and New Zealand, in the percentage of enrolled university students who come from overseas (see Figure 32), and ranks third in terms of the share of internationally mobile students hosted.⁷⁵ The sector is therefore an exporter in itself, making up the largest share of education exports.⁷⁶ The openness of the UK's university system, and ability to attract

⁷¹ This was a time when advanced economies recognised the value of access to higher education beyond national 'elites', and the value of university research for scientific and technological progress. See: E Schofer & J Meyer, *The Worldwide Expansion of Higher Education in the Twentieth Century*, *American Sociological Review* 70(6), 2005.

⁷² For more detail and context see G Azmat et al., *Universities and industrial strategy in the UK: review of evidence and implications for policy*, Centre for Economic Performance, October 2018.

⁷³ Adult Education level, Tertiary per cent of 25-64-year-olds, Source: OECD, *Adult education level (indicator)*, accessed 21 March 2022. This share was 25.7 per cent in 2000 and 50.1 per cent in 2021.

⁷⁴ J Britton et al., *The impact of undergraduate degrees on lifetime earnings*, Institute for Fiscal Studies, February 2020.

⁷⁵ Data from UNESCO show that in 2019 the UK hosted 8.1 per cent of the total number of internationally mobile students (489,019 out of 6 million students). Only the US and Australia hosted higher shares, at 16.1 per cent and 8.4 per cent respectively. See: UNESCO, *Global Flow of Tertiary-Level Students*, accessed 4 April 2022.

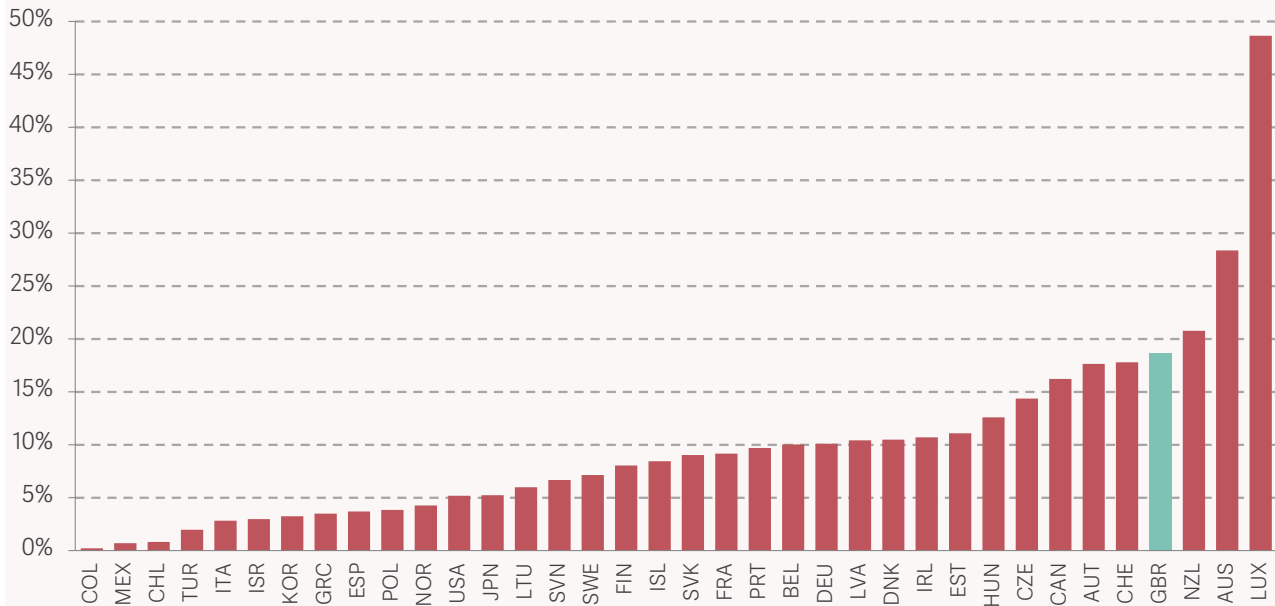
⁷⁶ Total education-related exports and transnational education activity in 2019 were £25.2 billion, and higher education made up the largest share of this (70 per cent). See: HM Government, *UK revenue from education related exports and transnational education activity*, December 2021.

high quality students and academics, has been a source of its strength and broader economic impact. Research has shown that international students

increase resources available for domestic students and, overall, have a positive impact on their learning experience.⁷⁷

FIGURE 27: Overseas students make up a high share of UK enrolments

Tertiary student inflow as a proportion of students enrolled, by country: UK, 2019



NOTES: This indicator shows the number of international tertiary students enrolled as a proportion of the total tertiary students enrolled in the destination (host) country, for OECD countries.
SOURCE: OECD, Education at a glance: Share of international students enrolled by field of education.

Research excellence

The UK has consistently performed well relative to other comparator countries with respect to its research quality and impact. An often-quoted statistic is that the UK, home to less than 1 per cent of the world’s population, accounts for 14 per cent of the most highly-cited academic publications.⁷⁸

The UK’s universities are a key asset in the UK’s broader innovation system, with a higher share of research and development (R&D) taking place in universities in the UK relative to its international peers. According to the OECD MSTI database, 23 per cent of UK gross expenditure on R&D in 2019 was performed in the higher education sector, compared with 17 per cent in Germany, 20 per cent in France, 12

⁷⁷ For a summary, see: G Azmat et al., *Universities and industrial strategy in the UK: review of evidence and implications for policy*, Centre for Economic Performance, October 2018.

⁷⁸ Department for Business, Energy and Industrial Strategy, *International comparison of the UK research base*, July 2019.

per cent in the United States and 16.5 per cent in the OECD on average.⁷⁹ A recent example that highlights the importance of UK university research is the development of the Oxford-Astra Zeneca Vaccine. This vaccine built on two decades of R&D at the University of Oxford, where over 97 per cent of the funding came from governments or charitable trusts.⁸⁰

More generally, however, despite the UK's strong research performance, its R&D spending (both public and private) has been lower as a share of GDP compared to comparator countries.⁸¹ There are also well-documented issues with respect to collaboration between universities and industry, and the extent that new ideas are commercialised in the UK.⁸² Some have argued that the career incentives of academics are a key barrier to achieving more

(local) economic impact,⁸³ while others recommend more focus on improving business demand for innovation.⁸⁴

The UK has set a target to reach an R&D spend of 2.4 per cent by 2027, and the Government has stated in recent policy announcements its objective for the UK to be a science superpower.⁸⁵ The Government's current review of the research, development and innovation (RDI) organisational landscape is intended to identify areas of improvement that can drive future growth and societal benefit.⁸⁶ Increased and targeted investment, improved collaboration across the system, and maintaining the UK's attractiveness for international students, academics, collaboration and funding – given change due to Brexit - will be key to success.

Pharmaceuticals

Section 2 showed that pharmaceuticals is one of the few goods categories in which the UK has revealed comparative advantage. In 2019, pharmaceutical goods accounted for just under 3 per cent of total UK exports, down slightly from 2005 (a trend that contrasts with the UK's main comparator countries). But for pharmaceuticals, exports of goods from the UK will only tell part of the story. We have also seen that the UK is a strong

⁷⁹ OECD, *Main Science and Technology Indicators*, September 2021.

⁸⁰ S Cross et al., *Who funded the research behind the Oxford–AstraZeneca COVID-19 vaccine?*, *BMJ Global Health* 6(12), 2021

⁸¹ J Oliveira-Cunha et al., *Business Time: How ready are UK firms for this decisive decade?*, *The Economy 2030 Inquiry*, November 2021.

⁸² Department for Business, Energy and Industrial Strategy, *The Dowling Review of Business–University Research Collaborations*, July 2015.

⁸³ For discussion on career incentives in business schools and how these are not aligned with maximising collaboration with local firms, see Chapter 3 in: D Willetts, *A University Education*, Oxford University Press, 2017.

⁸⁴ House of Commons Science and Technology Committee, *Managing Intellectual Property and Technology Transfer*, March 2017.

⁸⁵ See, for example, the UK Innovation Strategy which sets out the Government's ambitions for an innovation-led economy: Department for Business, Energy and Industrial Strategy, *UK Innovation Strategy: leading the future by creating it*, July 2021.

⁸⁶ Department for Business, Energy and Industrial Strategy, *Research, development and innovation organisational landscape: an independent review*, January 2022.

innovator in pharmaceuticals as measured by patents (Figure 9), but international supply chains in this industry are complex, with a high share of global manufacturing taking place in India and China (both in terms packaged medicines and base ingredients).⁸⁷

FIGURE 28: The UK's share of pharmaceuticals goods exports has been stagnant

Share of pharmaceuticals goods in total exports, by country: 2015 and 2019



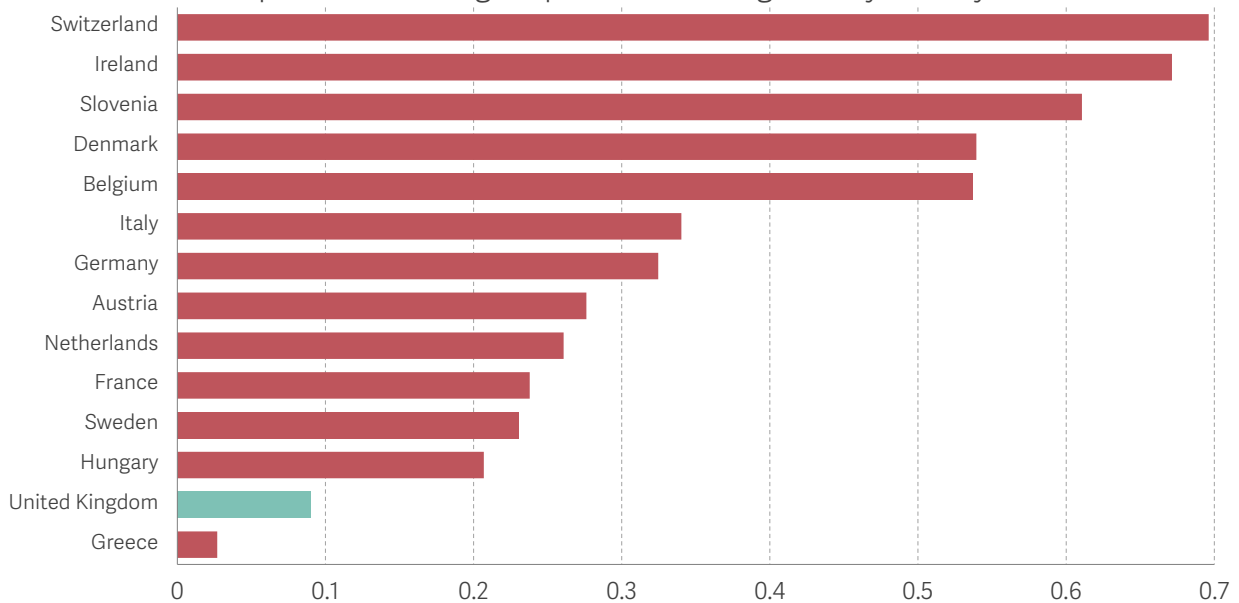
SOURCE: Analysis of Harvard Growth Lab, Atlas of Economic Complexity (HS version) and OECD-WTO, Balanced Trade in Services.

There are also many other (European) countries that are more specialised in this area (Figure 29), and therefore are potential competitors to the UK in this area, and a number of these – Switzerland, Denmark, Belgium and Hungary – were also shown to be specialised in pharmaceuticals and biotechnology innovation in the patents analysis in Section 2. This illustrates a link between domestic innovation and exporting that is important in the pharmaceuticals sector. During the period 2016 to 2019, the UK experienced a decline in its specialisation in pharmaceuticals exporting (see Figure 30), despite its high revealed technical advantage in the sector.

⁸⁷ See, for example: R Horner, [The world needs pharmaceuticals from China and India to beat Coronavirus](#), The Conversation, May 2020.

FIGURE 29: A number of advanced economies are more specialised in pharmaceuticals than the UK

Revealed comparative advantage in pharmaceutical goods, by country: 2019

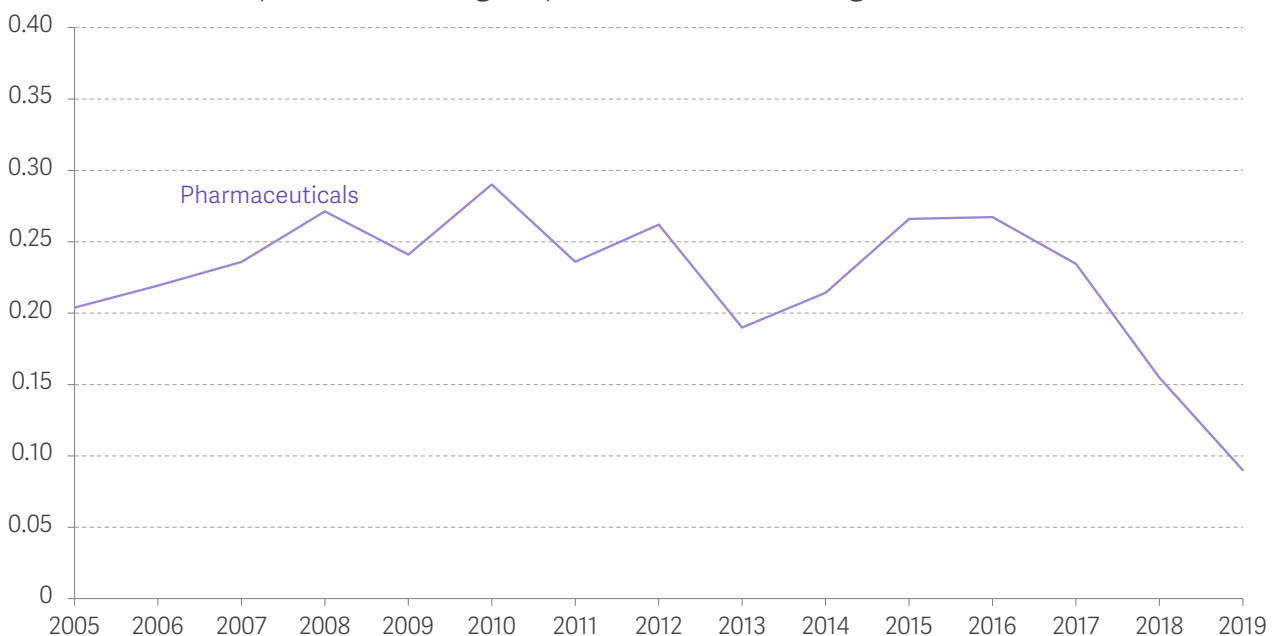


NOTES: RCA calculated using global trade, but bar chart restricted to OECD countries as well as China and Hong Kong.

SOURCE: Analysis of Harvard Growth Lab, Atlas of Economic Complexity (HS version) and OECD-WTO, Balanced Trade in Services.

FIGURE 30: Recent years saw a decline in the UK’s pharmaceutical specialisation

Revealed comparative advantage in pharmaceutical traded goods: UK, 2005-2019



SOURCE: Analysis of Harvard Growth Lab, Atlas of Economic Complexity (HS version) and OECD-WTO, Balanced Trade in Services.

The manufacture of pharmaceuticals accounted for 1 per cent of total UK GVA in 2019 (7 per cent of manufacturing GVA).⁸⁸ These activities are part of the broader life sciences industry, which also includes medical technologies and biotechnologies, and the Office for Life Sciences estimates this sector employed more than a quarter of a million people in 2019.⁸⁹

Despite the recent decline in pharmaceuticals RCA, these sectors have a solid and longstanding basis in the UK. From the discovery of penicillin by Alexander Fleming in 1928, to the invention of monoclonal antibodies in the 1980s, the UK has a strong history of innovation in medicines and healthcare. These strengths are founded on excellence in the UK's academic institutions, in industry and the NHS. The UK is home to three of the top ten global universities in this field, and a large number of prestigious scientific journals. UK researchers produce the third highest number of high-quality life sciences papers,⁹⁰ and the impact of UK research in health-related fields is high relative to other G7 countries (see also Box 3).⁹¹ The importance of the NHS in this ecosystem has been highlighted during the pandemic: its research focus, capacity and expertise allowed for large-scale clinical trials, and several of the UK studies that tracked the virus were world-leading.⁹²

Although the UK lags its main peers on overall research and development (R&D) spending as a share of GDP, its performance is strong in terms of government-financed health R&D, where it is second only to the US. Nearly one-fifth of business expenditure on R&D in the UK relates to pharmaceuticals. The analysis of RTA in Section 2 showed that the UK is specialised in its patenting activity in pharmaceuticals and biotechnology, but Figure 11 showed that UK patenting intensity (as measured by patenting per 100,000 employees) is lower than Belgium, Denmark and Switzerland, all countries that are more specialised in terms of patenting in these fields.

⁸⁸ OECD.Stat, *Value Added and its components by activity*, data extracted 24 March 2022.

⁸⁹ Office for Life Sciences, *Bioscience and health technology sector statistics 2019*, August 2020. These estimates are based on a government database of companies in the sector.

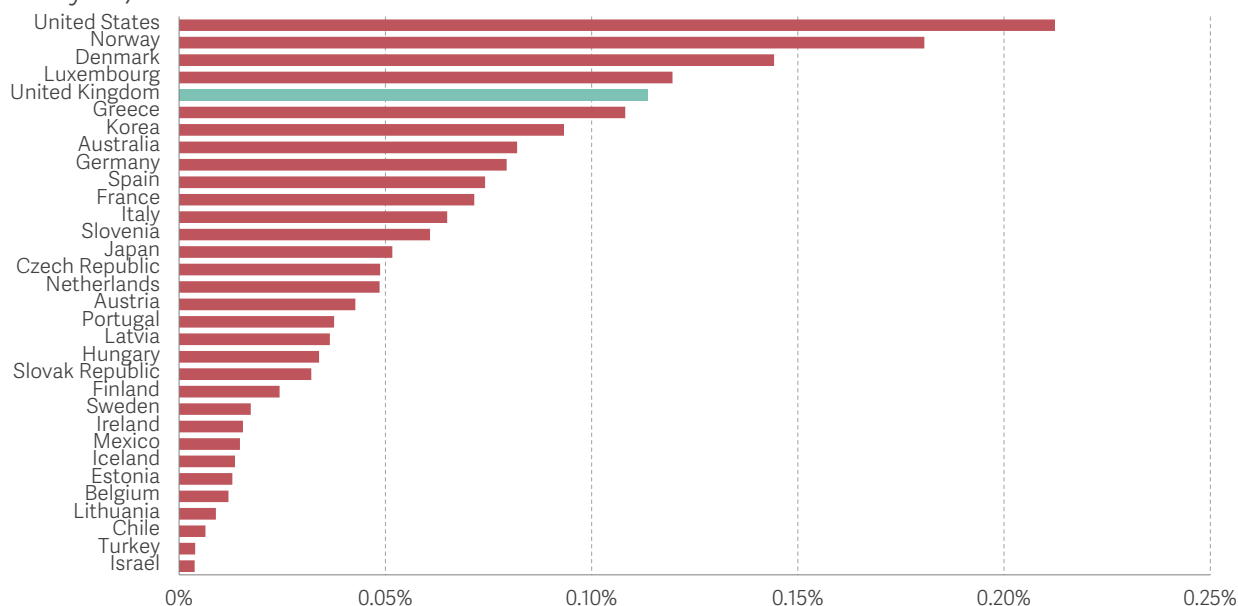
⁹⁰ This was the case in 2019 and 2020 according to the Nature Index, <https://www.natureindex.com/annual-tables/2021/country/life-sciences> (accessed 30 March 2022).

⁹¹ S Curran, H Legido-Quigley & J Spencer, *The UK as a global centre for health and health science*, APPG on Global Health, February 2020.

⁹² Office for Life Sciences, *Life Sciences Vision*, July 2021.

FIGURE 31: The UK government spends a relatively high share of GDP on health R&D

Government budget for health R&D as a proportion of GDP, by country: 2020 (or nearest year)



NOTES: Government budget allocations for R&D with the socioeconomic objective of Health, PPP Dollars, Current prices, normalised by GDP (expenditure approach), current prices PPPs. Data for Canada, New Zealand, Poland and Switzerland were not available in recent years.

SOURCE: Analysis of OECD. Government budget allocations for R&D and GDP, data extracted 18th March 2022.

The pharmaceuticals, and the wider life sciences, are a strategic priority of the UK Government. The Life Sciences Vision, published in 2021, sets out how it sees life sciences as “one of the great drivers of growth in the twenty-first century”.⁹³ And yet, this is an area where Brexit creates continued uncertainty, complexity and disruption, particularly with respect to the effects of regulatory divergence, removals of mutual or unilateral recognition agreements, and increased border bureaucracy. It has been claimed that these factors have deterred investment.⁹⁴ Growth in these sectors will require clarity on such issues, together with policies to maximise excellence and impact in the relevant parts of the UK’s research system.⁹⁵

This more detailed consideration of three key areas of UK specialisation has shown that they have each taken time to build, and have relied on broader institutional characteristics and linkages in the economy. All three areas rely on a highly educated and innovative workforce, and international openness to talent and ideas. In the case of finance and business services, the UK’s advantages reflect London’s role as an international financial centre. The UK’s creative strengths can be traced to cultural

⁹³ Office for Life Sciences, *Life Sciences Vision*, July 2021.

⁹⁴ M Dayan et al., *Going it alone: health and Brexit in the UK*, Nuffield Trust, December 2021.

⁹⁵ Another area of current uncertainty related to this is the association of the UK with Horizon Europe which was announced in January 2022, but which is yet to be formally approved.

openness, high-quality creative education and – in media – the role of public service broadcasting shaping the market. The UK's strengths in pharmaceuticals are linked to its scientific excellence and research base. Protecting and building characteristics that contribute to success in these areas, and new areas of opportunity for the UK including clean technologies and services will be a core part of a successful economic strategy.

Section 5

The implications of the UK's specialisations for its wider economic strategy

Previous sections have shown that the UK is specialised across a range of services, and innovates in several fields. Moreover, its advantages appear to be fairly persistent over time. We have also looked at prospects for some of our key current specialisms. We now ask what are the implications of these specialisms: are they in some sense, the 'right' products to be producing? And what do they mean for regional and interpersonal inequality?

When comparing the types of goods and services that different countries specialise in, countries that are most similar to the UK tend to be rich, but to invest less, other things equal, in human and physical capital, than countries who specialise more in manufacturing. The UK's export pattern, both in terms of the extent of specialisation, and its mix across different products, is consistent with that of many other rich countries. And while the UK's export growth was slower than the USA's in the 10 years to 2019, none of this is attributable to its product mix.

However, just as services exports are common among rich countries, they are also more common in rich areas within the UK: the UK's specialisations may be driving higher regional inequality. Additionally, while tradeable services industries provide more 'good jobs' (jobs that pay between the 50th and 90th percentile of the wage distribution) than non-tradable industries do, tradable goods industries do even better on this metric. While this does not mean that the UK can or should radically change the mix of its specialisation, it does suggest that an economic strategy which seeks to tackle years of living standards stagnation will need to do more to spread the benefits of the UK's strengths more widely.

Previous sections of this report have characterised the UK's relative export strengths as persistent and reasonably broad. But what is less clear is whether the strengths we have are the ones we should want. There are several characteristics that may make a product mix desirable: whether the mix of specialisms support economic prosperity; whether they position the UK in strongly growing areas; whether they help generate incomes that are widely spread across regions; and whether they support well paid jobs. This section considers each of these aspects of the UK's mix of specialisations in turn.

The UK's pattern of specialisation places it in a group that includes high-income, diversified countries such as the United States and France

We showed earlier in Section 2 that the extent of the UK's product specialisation is fairly typical of developed countries generally, but what specific countries is the UK's mix of specialisations most similar to?

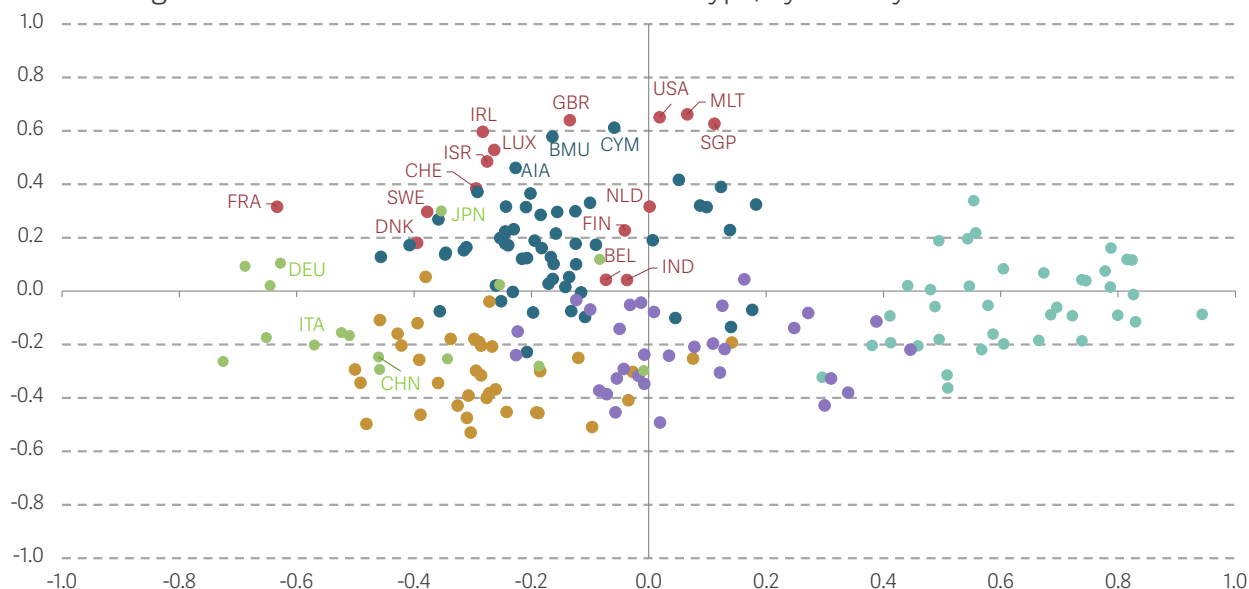
To assess this, we use data on the RCAs across products for all countries, and identify several underlying 'types' of export specialisation. The real-world export specialisations of a country can then be thought of as a mix of these underlying types.⁹⁶ We then split the countries into a set of clusters, distinguished by how much of a mix of each of these kinds of specialisation they exhibit. Both the number of clusters and their membership is driven by the data rather than by our judgement.⁹⁷ Six clusters emerge from the data, four of which represent clearly interpretable patterns of specialisation – oil and gas, agriculture, manufacturing, and services – and two of which represent low-income or unspecialised countries. Figure 32 shows how these six clusters are distinguished from each other on two of the ten underlying types.

⁹⁶ We take principal components of the set of 194 countries in our data, with each product being an observation for all countries and the observations being weighted by the share of that product in world trade. We retain the first 10 principal components, each of which represents a different underlying characteristic export specialisation, which can be thought of as driving RCA in a set of goods that the data finds to be correlated across countries. We then use a k-means clustering algorithm to group the countries according to their loadings on these principal components. This two-step process is necessary to reduce the dimensionality of the data before clustering because there are too many products to meaningfully cluster the raw RCAs. Standard tests suggest that the data are best described with six clusters.

⁹⁷ Both the number of principal components and the number of clusters are chosen with 'elbow plots' which assess the extra information that an additional principal component or cluster adds on the margin.

FIGURE 32: The UK is a services specialist, along with several high-income countries such as the United States, Singapore and France

Loading of countries on two of the ten identified type, by country and cluster: 2019



NOTES: The clusters of countries are identified by k-means clustering of the factor loadings of each country onto the first 10 principal components of the data. Each cluster is represented by a different colour of dots. The axes show the loadings of the countries on the two principal components which the services cluster countries have the highest loadings on.

SOURCE: Analysis of Harvard Growth Lab, Atlas of Trade Complexity; OECD-WTO, Balanced Trade in Services.

Unsurprisingly, the UK is part of a ‘services’ cluster. It shares membership of this cluster with a diverse and generally prosperous group of countries, including many that observers, rightly or wrongly, do not typically think of as having a narrow or vulnerable industrial specialisation, such as the United States, France and Singapore, among others. As we discuss in Box 4, the UK’s service-focused export mix is part of the explanation for why the UK’s exports grew relatively slowly in the decade to 2019, but it is by no means the dominant one.

BOX 4: The UK’s exports grew relatively slowly in the decade to 2019, but only in small part because of its product mix

Recent years have seen a relative slowdown in UK export growth: the dollar value of UK exports grew by only 3.3 per cent in the ten years to 2019, a rate comparable to that of France and Germany, but below that of the United States and especially China

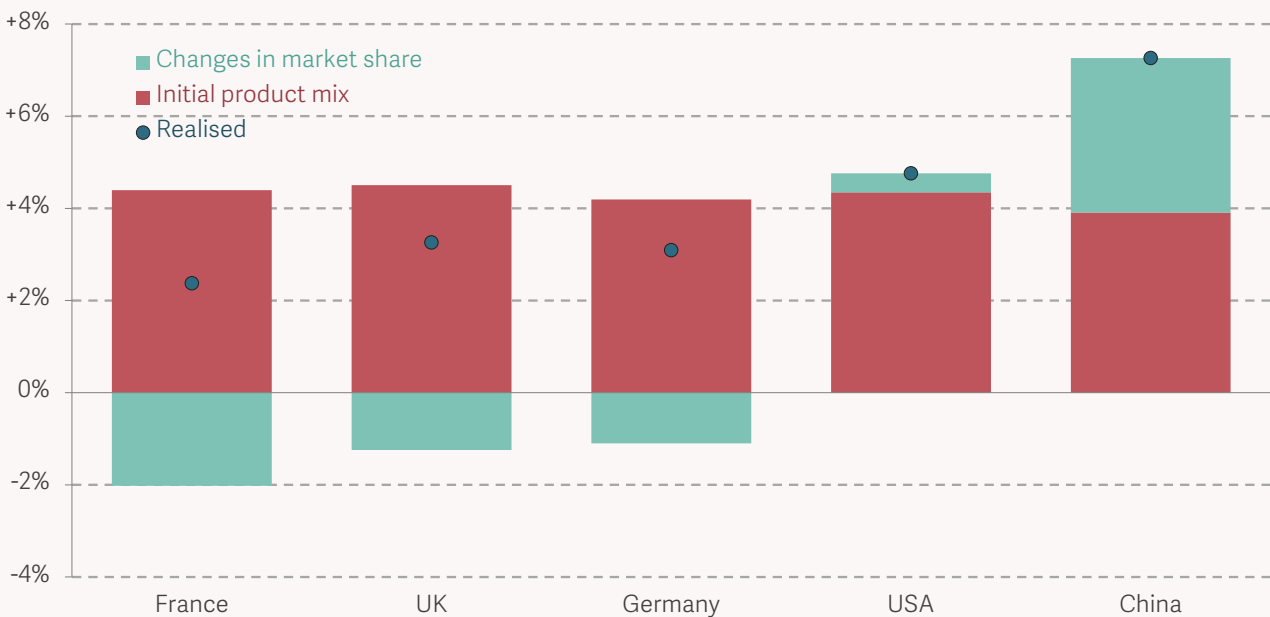
(see Figure 33). However, the initial product composition of UK exports was in fact tilted slightly towards products in which world trade grew quicker than average, meaning that the UK’s pre-existing product mix did not hold its export growth back — in fact based

on its product mix UK exports should have grown faster than in these four comparator countries (at around 4.5 per cent per annualised). However, its underperformance was due to the UK losing global market share in these

products, rather than the country's specialism. For example, product mix explains none of the 1.5-percentage-point shortfall in growth in UK exports when compared to the US over this period.

FIGURE 33: The UK's export mix in 2009 does not explain its slow growth in the following decade

Contributions to annualised growth in exports by country (current US dollars): 2009 to 2019



SOURCE: Analysis of Harvard Growth Lab, Atlas of Economic Complexity (HS version) and OECD-WTO, Balanced Trade in Services.

NOTES: The realised growth in total export volumes is the compound annual growth rate between 2009 and 2019. Predicted growth is the growth that is explained by the country's initial export composition across products and the subsequent global growth in each product. "Difference" corresponds to the realised growth minus the predicted growth.

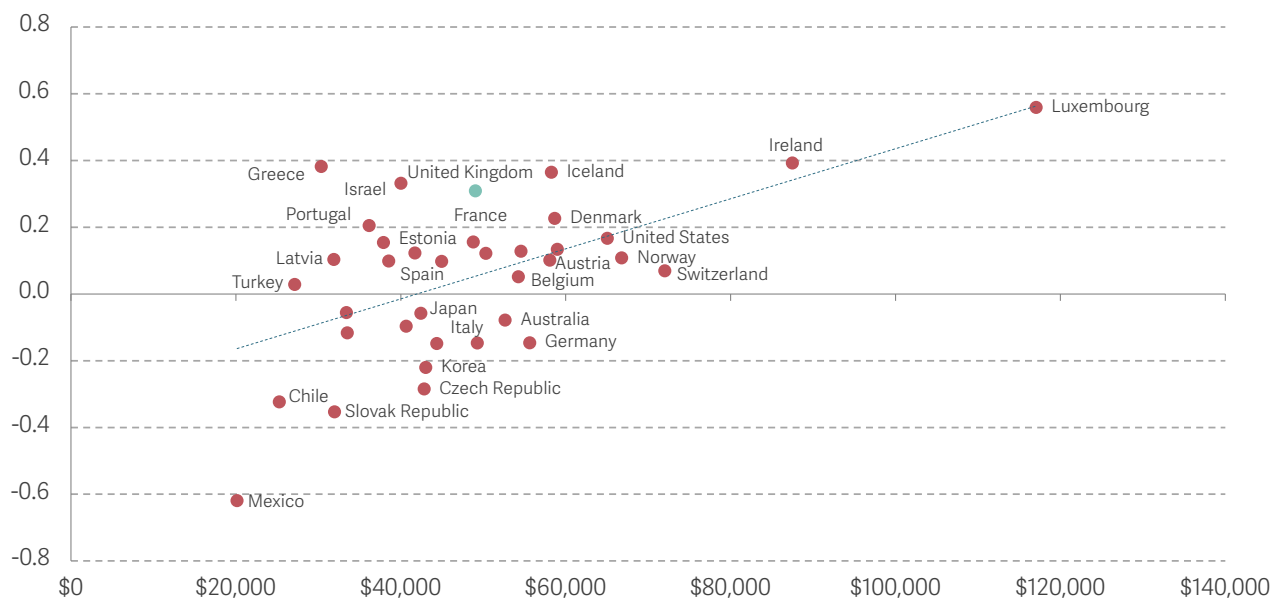
The cluster of countries that includes the UK is the richest, but has less human and physical capital than the manufacturing cluster

The mix of specialisation within each of these clusters is evidently supported by a diverse set of institutions and economic models: for example, the service exporters include France and Singapore, while the manufacturers include both Germany and China. The services cluster is on average the richest of the six (consistent with this, Figure 34 shows that richer countries tend to specialise more in services, albeit with many exceptions). Perhaps surprisingly, given the apparent prevalence of former British colonies in the

services cluster, there is no evidence that being Anglophone leads to specialisation in services.⁹⁸ It is also the case that being a services specialist does not force or require a country to have low taxes.

FIGURE 34: Richer countries tend to specialise more in services, although there are many countries richer than the UK which specialise more in goods

GDP per capita at PPP and revealed comparative advantage in services, by nation: 2019



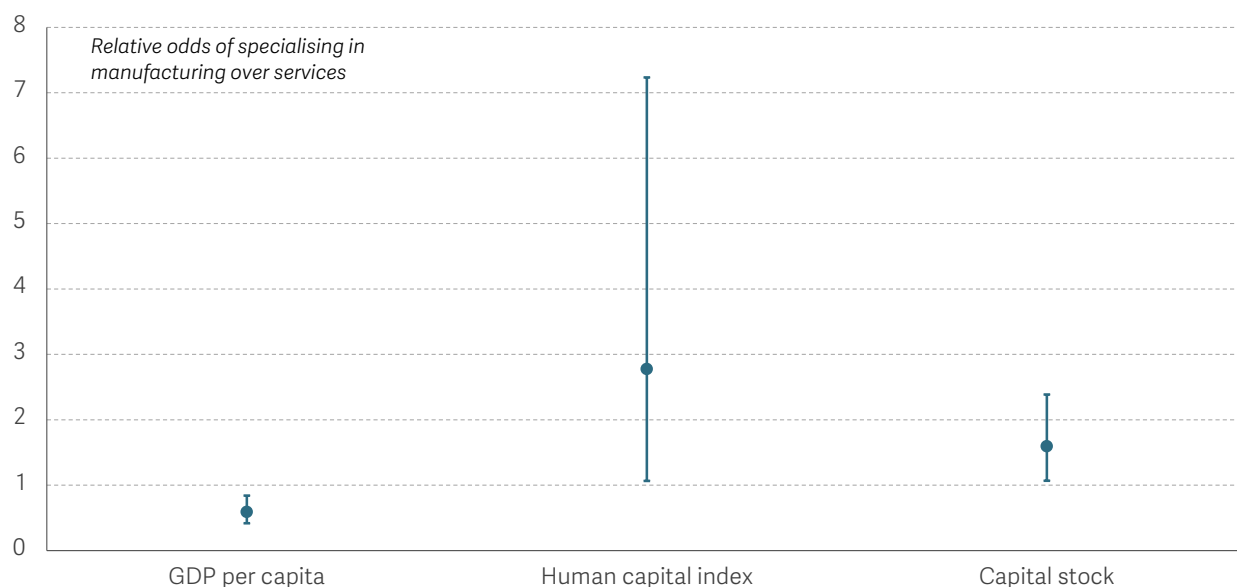
SOURCE: Analysis of Harvard Growth Lab, Atlas of Trade Complexity; OECD-WTO, Balanced Trade in Services; OECD, National account at a glance

Given the importance of immutable physical endowments in determining membership of the oil and gas and agriculture clusters, the main other cluster of interest to the UK is the manufacturing cluster, the members of which include several central European countries such as Germany and Slovakia, plus a number of East Asian countries. The key detectable difference between the services and manufacturing clusters is that the manufacturing countries have, on average, higher levels of physical and human capital, controlling for their income (see Figure 35). Among other things, this reflects heavy investment in education and physical capital in the former Communist countries that now specialise in manufacturing.

⁹⁸ We obtain these results from a multinomial logit model of assignment to the six clusters, with the services cluster as the base category, and also a binominal logit model using just the services and manufacturing clusters. The regressors are official language, country population, land area, GDP per capita and indices of human and physical capital.

FIGURE 35: Specialisation in manufacturing is associated with higher levels of physical and human capital, other things equal

Estimates of relative odds of specialising in manufacturing associated with 10 per cent increase in GDP per capita, human capital and physical capital



NOTES: The chart shows the results of a multinomial regression of group membership on GDP per capita, human capital, the capital-labour ratio, land area and population (all in logs), the tax-GDP ratio and indicator variables for insularity and English as an official language. The vertical axis shows the relative odds of being in the manufacturing group of countries, relative to the services group, for an 0.1 log point change in the respective right-hand side variable. A value of 1 represents no change in odds, a value of 2 is a doubling of the odds, 0.5 a halving of the odds, and so on. The low and high estimates represent the extrema of 90 per cent confidence intervals centred around the central estimate. We only show coefficient estimates for the non-geographic variables with parameter estimates significant at the 10 per cent level. SOURCE: Analysis of Harvard Growth Lab, Atlas of Trade Complexity; OECD-WTO, Balanced Trade in Services, Penn World tables, CEPIL.

Section 3 showed that export specialisations have not generally tended to change quickly. Here, we have shown that countries which specialise in similar products to the UK are generally prosperous and, although the UK's service-focused export mix is part of the explanation for why the UK's exports grew relatively slowly in the decade to 2019, it is by no means the dominant one. Countries with similar specialisations to the UK also have a wide range of institutional arrangements, suggesting there is no need for the UK to become more like Singapore (or, indeed, more like France). We have also shown that an alternative strategy of moving to manufacturing may necessitate, or would at least be encouraged by, increased investments in physical and human capital, which start from a relatively low base in the UK.⁹⁹

Moreover, and perhaps relatedly, major swings between goods and services specialisation are rare in the data. Among the set of high-income OECD countries who have not undergone post-communist transition, only two (Norway and Finland) since

⁹⁹ See, for example: J Oliveira-Cunha et al., *Business Time: How ready are UK firms for this decisive decade?* Resolution Foundation, November 2021.

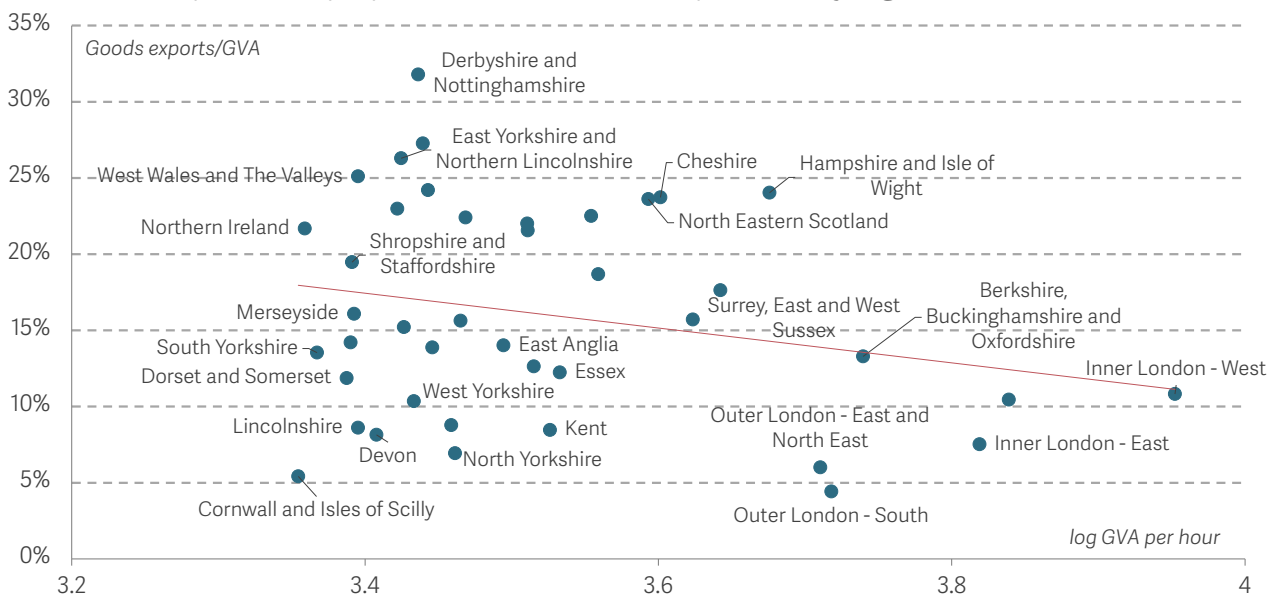
1980 have seen an absolute change in services RCA of 0.3 units (this would be enough to move the UK from being a services specialist to a country that exports goods and services in the same proportions as the rest of the world). Moving the UK heavily towards manufacturing would, therefore, represent a historical exception, would necessitate higher investment in machines and people, and would not necessarily be associated with a rise in aggregate incomes in the UK.

More productive areas of the UK export more services, but goods exports and productivity are not related across regions

Although the UK's specialisms are associated with being a rich nation and do not seem to be the cause of the UK's weak export growth, they do have important consequences for regional and interpersonal inequalities. We just saw that countries specialising in services exports tend to be richer than average among OECD countries. Figure 36 and Figure 37 show that the same goes for more productive regions within the UK: more productive areas, measured by GVA per hour, tend to export more services, while goods exports are uncorrelated with regional productivity. More productive areas of the country therefore tend to specialise more in services than in goods.

FIGURE 36: Goods exporting is uncorrelated with regional productivity

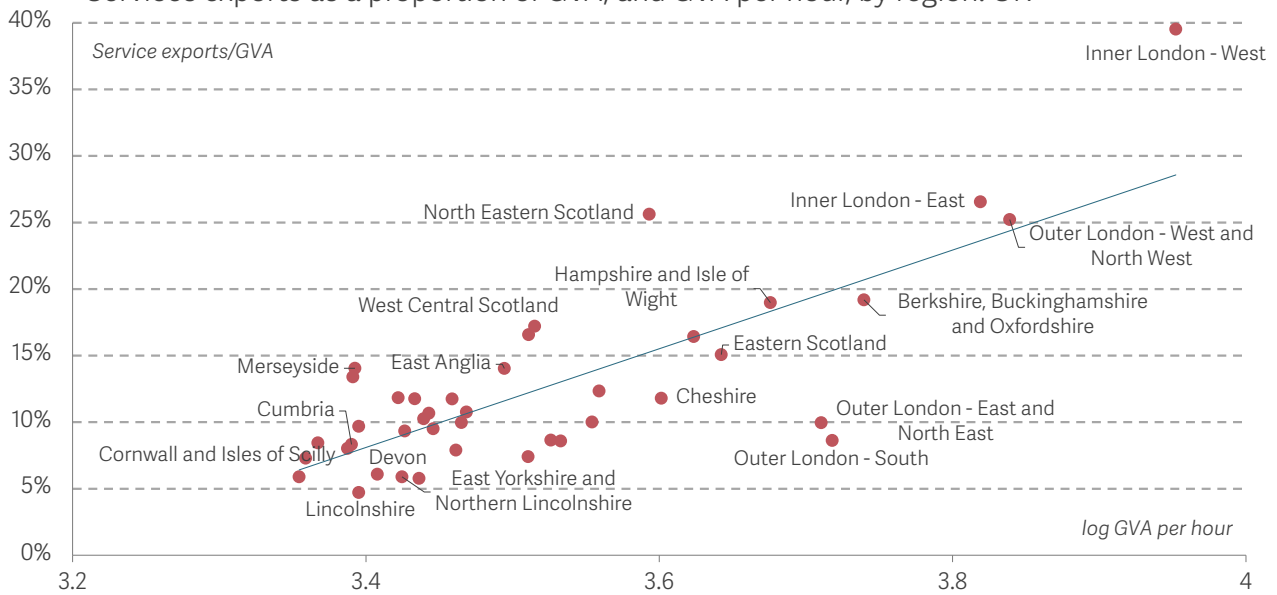
Goods exports as a proportion of GVA, and GVA per hour, by region: UK



SOURCE: Analysis of ONS, Regional gross value added (balanced) by industry: all International Territorial Level (ITL) regions, Subnational Trade in Services data tables and Regional Trade in Goods Statistics disaggregated by smaller geographical areas.

FIGURE 37: **Services exporting is associated with higher regional productivity**

Services exports as a proportion of GVA, and GVA per hour, by region: UK



SOURCE: Analysis of ONS, Regional gross value added (balanced) by industry: all International Territorial Level (ITL) regions, Subnational Trade in Services data tables and Regional Trade in Goods Statistics disaggregated by smaller geographical areas.

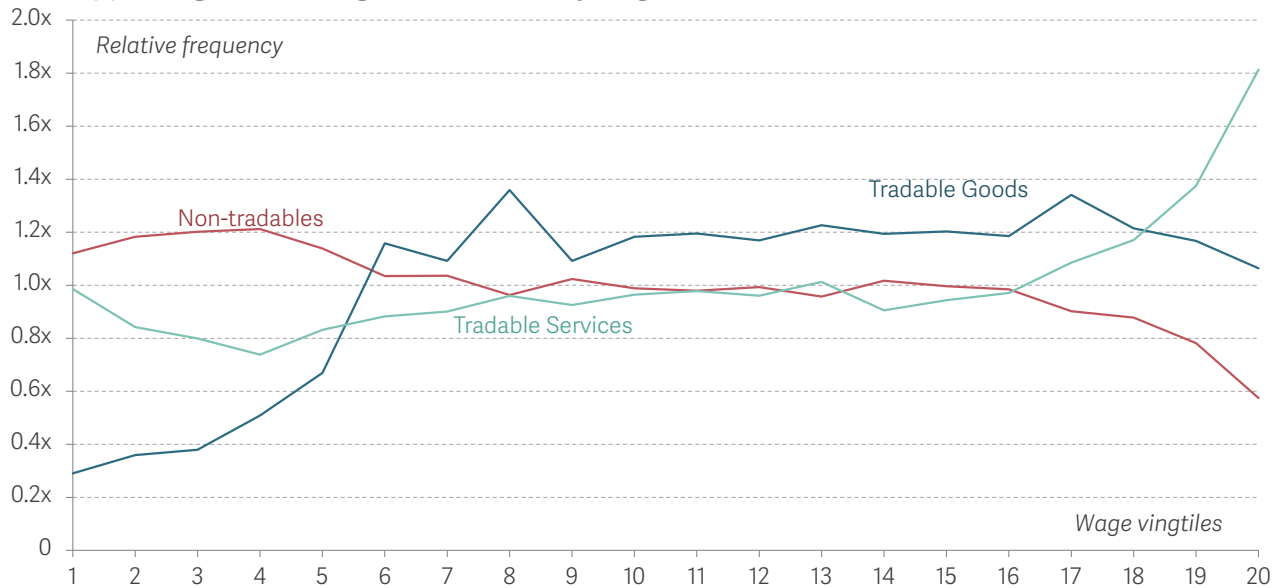
Tradable industries are associated with more ‘good jobs’ than non-tradable industries, but tradable goods do better than tradable services

Although goods-exporting is associated with lower productivity at the regional level, tradable goods industries are more likely to provide a high share of ‘good jobs’ – which we define as those paying between the median and the 90th percentile of the aggregate wage distribution, as these jobs are able to support decent living standards and offer progression for lower earners – than either tradable services or non-tradables. Figure 39 shows the fraction of all workers in non-tradables, tradable goods and tradable services industries in each vingtile of the aggregate wage distribution. If the wage distributions in all three types of industry were the same, then each type would (by definition) have 5 per cent of its workers in each vingtile. Instead, disproportionately large fractions of the jobs in tradable goods industries are in the upper-middle part of the wage distribution, while non-tradables are overrepresented in the bottom quartile, and tradable services are overrepresented at the very top. This matches other work on top earnings and top incomes in the UK that has shown the importance of jobs in finance and business services – key tradable service industries – in pushing up pay and income inequalities at the very top: in 2016-17, over half of the around 50,000 people in the top 0.1 per cent

of the UK taxable income distribution worked in “finance, insurance and real estate” or were providing “professional, scientific and technical services” (a category that includes lawyers and architects).¹⁰⁰

FIGURE 38: Tradable goods industries provide proportionally more jobs in the upper-middle part of the wage distribution

Relative frequency of total jobs in non-tradables, tradable goods and tradable services appearing in each vingtile of the weekly wage distribution



NOTES: Industries are separated into goods and services according to the standard ONS classification, and into tradable and non-tradable according to the categorisation in B Broadbent et al., *The Brexit Vote, Productivity Growth and Macroeconomic Adjustments in the United Kingdom*, mimeo., 2020. Wage vingtiles are calculated using gross weekly wages in the LFS. Workers in the three types of industry are assigned to and counted in each vingtile. The counts are divided by 5 per cent of the total number of workers in the corresponding type. A value of 1 on the y axis means that 5 per cent of that type of worker’s jobs are found in the corresponding aggregate wage vingtile. A value of 2 means 10 per cent, and so on. SOURCE: Analysis of ONS, Subnational Trade in Services data tables and Regional Trade in Goods Statistics dis-aggregated by smaller geographical areas; Labour Force Survey.

This shows how the UK’s specialism in services trade is associated with greater inequality – both spatially and between workers. The implication for our wider economic strategy is that, if we retain our pre-existing services specialism, policy will need to do more work than it is currently doing to ensure that the gains from international trade are spread widely across the country and across the income distribution.

¹⁰⁰ See: M Brewer & C Samano-Robles, *Top incomes in the UK: analysis of the 2015-16 Survey of Personal Incomes*, Institute for Social and Economic Research, June 2019. See also: R Joyce, T Pope & B Roantree, *The characteristics and incomes of the top 1%*, Institute for Fiscal Studies, August 2019.

Brexit also makes our services specialism a more precarious one

Our final consideration is to think briefly about how the UK's current export strengths will be affected by our new trading relationship with the EU.¹⁰¹ The UK's specialisation in services increased over a long period of deepening trade liberalisation with the EU, especially in services.

Services are not often restricted by tariffs or checks, but national regulations on licensing and immigration can severely limit the extent to which services can be imported into an economy. To date, the single market is the most integrated trade area for services in the world, supported by freedom of movement and mutual recognition of standards regimes. The Trade and Co-operation Agreement has resulted in much higher trade barriers for UK exports, especially in a range of regulated services, for which it contains limited provision. As seen in Section 4 this change in our trading arrangement has already disrupted some of our key industries and areas of comparative strength. Future Economy 2030 papers will discuss how policy makers will have to wrestle with the trade-offs involved in a partial re-integration into EU trade, if this option is available to the UK, or deal with and mitigate the consequences for some of our key export industries.

This section has explored the implications of the UK's specialisms for our economic strategy. We have shown that our product mix is shared with several other high-income countries, and that these have a wide range of institutional characteristics. This suggests that a service specialism is a viable route to prosperity, and that it is not necessary to be more like Singapore, or more like France, to succeed at this. We also showed that countries with a heavy specialism in manufacturing typically have much higher levels of human and physical capital than the UK, and that a shift in specialisation of the size the UK would need to do to de-emphasise services has rarely been seen in comparable rich, developed countries.

On the other hand, a service-focused economy appears to be correlated with increased regional and earnings inequality, and may face challenges from our new position outside the European Union.

¹⁰¹ J De Lyon et al., [Trading places: Brexit and the path to longer-term improvements in living standards](#), Resolution Foundation, October 2021.

Section 6

Conclusion

This report has shown that the UK has a deep, and relatively longstanding, revealed comparative advantage in a number of products. These products are predominately services: UK exports are more heavily weighted towards services than any country of comparable size. But, given the breadth of its specialism in services and its presence in a number of goods categories, it is not much narrower an exporter than comparable countries – somewhere between France and Japan, and much broader than Switzerland or Ireland.

The UK's advantages have been sticky, in many cases deriving from a complex web of capabilities and institutional arrangements. Three key areas of UK specialisation – finance and business services, creative industries and pharmaceuticals – rely, as do many others, on a highly educated and innovative workforce, and international openness to talent and ideas. A common source of strength – as it is for all knowledge-intensive sectors – is the UK's university system, which includes world-class universities across several disciplines, and a disproportionate share of high-quality academic research.

Our product mix is shared with several high-income countries, and these have a wide range of institutional characteristics. This suggests that a service specialism remains a viable route to prosperity, and that it is not necessary to be more like Singapore, or more like France, to succeed at this. We also showed that countries with a heavy specialism in manufacturing typically have much higher levels of human and physical capital than the UK, and that a shift in specialisation of the size the UK would need to do to de-emphasise services has rarely been seen in comparable rich, developed countries. On the other hand, a service-focused economy appears to be correlated with increased regional and earnings inequality, so there may be a trade-off between the UK playing to its international strengths and providing jobs for a wide range of workers in many regions of the country. Finally, some of our service-exporting sectors may face challenges resulting from our new position outside the European Union.

As the UK makes its way through a decade of major change, these conclusions raise a number of important policy questions that must be addressed as part of a new economic

strategy. These include:

- How to protect and build the UK's key export industries in the face of higher trade costs, especially in regulated services?
- Whether and how to reduce trade costs for UK exporters, especially in services, and what concessions to accept in other policy areas to achieve this aim?
- How to develop strengths in products adjacent to those where the UK has strengths?
- Whether to undertake the large investments necessary to enter new industries, and how to co-ordinate them?
- How to spread the benefits of the UK's advantages in services widely across the country and the workforce?

Future reports in the Economy 2030 Inquiry will attempt to set out how best to achieve these goals.

Annex 1 : Data

Trade

We employ three datasets with global coverage in our trade (export) analysis, each offering advantages and disadvantages in terms of timeframe and level of disaggregation of goods and services. These datasets, based on raw trade flows reported by countries, are cleaned and pre-processed using methodologies developed by their respective research institutions to overcome several inconsistencies in the reporting process, and thus represent the best estimates available.

Trade datasets

Harvard's Atlas of Economic Complexity

From Harvard's Atlas of Economic Complexity, we obtain an unbalanced panel of goods and services data derived from the United Nations Statistical Division (COMTRADE) and the IMF Direction of Trade Statistics, respectively.

Goods are available in two classification formats. The first one is based on the Standard International Trade Classification (SITC) revision 2, covering the period from 1962 to 2019. Due to the longer time-series and need to maintain consistency of goods segments across time, the data is relatively less disaggregated and detailed. The second one is based on the Harmonised System (HS) 1992, which offers a more contemporary and granular classification, but covers the shorter period of 1995 to 2019.

Services data is available from 1980 onwards, and grouped into a few broad categories: travel and tourism, information and communications technology (ICT), insurance and finance, and transport. It is available for roughly 50 to 75 per cent of all countries available in the Atlas.¹⁰²

OECD-WTO Balanced Trade in Services Database (BaTIS)

The BaTIS dataset, available for the period from 2005 to 2019, focuses on services trade, and provides balanced flows at a relatively more disaggregated level, following the categories in the Extended Balance of Payments Services Classification (EBOPE) 2010. BaTIS's starting point is the WTO-UNCTAD dataset, which combines reported data from multiple sources, including Eurostat, OECD, IMF, as well as national sources.¹⁰³

¹⁰² More details on the data and cleaning methodology are available [here](#).

¹⁰³ For more details on the data and cleaning methodology see: A Liberatore & S Wettstein, [The OECD-WTO Balanced Trade In Services Database \(BPM6 Edition\)](#), WTO, June 2021.

Combining different sources

We employ the SITC dataset, which provides the longest timeframe, when analysing the UK's export flows across decades. As for the cross-sectional analysis in 2019 and analyses of specific sectors in Section 4, we combine data from goods and services from the HS dataset and BaTIS, respectively. This allows us to calculate countries' RCAs more precisely at a more disaggregated level, particularly for services trade.

Data cleaning steps and limitations

We also apply our own cleaning steps to the pre-processed data, in particular to the SITC and HS datasets. For consistency with BaTIS, we replace (rare) negative export flows found in some service categories (insurance and finance, and ICT) with zeros.¹⁰⁴

Furthermore, we drop two goods categories in the SITC dataset ("Postal packages not classified according to kind" and "Special transactions and commodities not classified") due to many missing flows across years, as well as two services categories in both SITC and HS datasets ("ZZ" and "Unspecified").

The main limitation of the Atlas datasets is that, unlike BaTIS, the SITC and HS datasets are unbalanced – that is, some country-product pairs are missing in certain years. Given that RCAs are calculated using all economies available (i.e. comparative advantages are based on worldwide trade), a missing country-product pair affects the denominator in the RCA formula. Approximately 21 per cent of all possible country-product pairs are missing in 1989, going down to 6 per cent in 2019.

Patents

Our analysis uses the 2018 Spring edition of the Worldwide Patent Statistical Database (PATSTAT Global) published by the European Patent Office (EPO). PATSTAT contains information on patent applications filed with patent authorities in various countries. Patent applications are grouped into 'patent families' if they cover similar technical content or refer to the same invention.

These patent families are the unit of measurement in our analysis. We assign a geographical location to each patent family by mapping it to the country of residence of the inventors when the patent application was filed. Therefore, one patent family can be assigned to multiple countries. We restrict our analysis to the period 1960 to 2015 for consistency. One of the drawbacks of this dataset is that there may be missing country values for inventors associated with patent families. We restrict the dataset to patent

¹⁰⁴ Negative export flows may occur, for instance, when major events, such as natural catastrophes, require large payments of claims, exceeding the value of premiums in a given period. See: A Liberatore & S Wettstein, [The OECD-WTO Balanced Trade In Services Database \(BPM6 Edition\)](#), WTO, June 2021.

families which include patent applications filed with more than one patent authority. Restricting patent families with such a constraint allows one to focus on higher-valued patents.¹⁰⁵ The resulting sample dataset of patent families with size greater than one includes a significantly larger share of patent families for which country information is available.

PATSTAT classifies patents according to the Cooperative Patent Classification system (CPC). The CPC classification system is a result of a joint effort between the United States Patent and Trademark Office (USPTO) and the EPO. Its objective is to harmonize the European Classification system (ECLA) and the United States Patent Classification (USPC) while being compliant with the International Patent Classification system (IPC). The CPC classifies patents at a very granular technological level. A patent can have more than one CPC classification if the innovation is pertinent in more than one technological context. We aggregate the classifications at the CPC class level for our analysis. There are 126 CPC classes across nine sections: Human necessities; Performing operations, transporting; Chemistry, Metallurgy; Textiles, Paper; Fixed construction; Mechanical Engineering, lighting, heating, weapons, blasting engines or pumps; Physics; Electricity; New technological developments, cross-sectional technologies. We also classify the patent families according to 41 technological fields to understand competencies across broad technological areas.

The CPC also includes a specific class ('Y02') related to climate change mitigation technologies of different types, which we use to classify technology areas as being 'clean'.

One of the limitations of working with patents is that not all innovation is patented. For example, innovation in the services or in the creative sector is relatively harder to capture using patent data. Another limitation is the missing information such as technological classification or inventor country at a patent family level. There are inconsistencies of patent applications over time, but this is mainly limited to national patent authorities from industrialising countries.¹⁰⁶ For all the limitations associated with PATSTAT, it provides a rich dataset to observe innovative activity as well as to understand the innovative capabilities of countries.

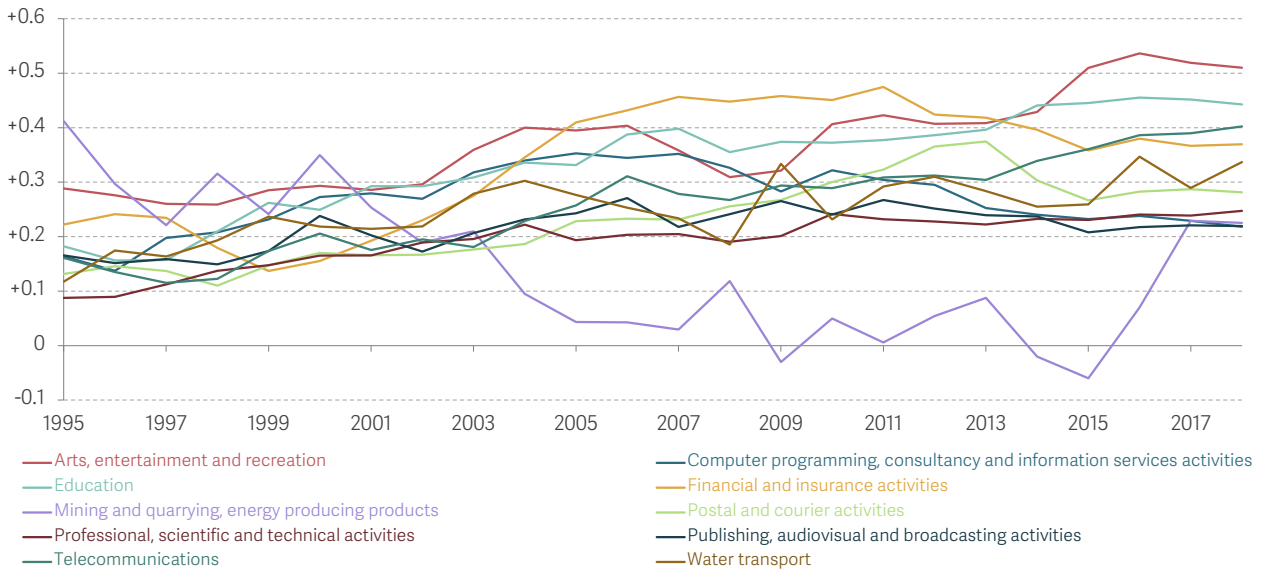
¹⁰⁵ See: D Harhoff, F Scherer & K Vopel, [Citations, family size, oppositions and the value of patent rights](#), Research Policy 32, September 2003.

¹⁰⁶ G Rassenfosse et al., [Low-quality patents in the eye of the beholder: Evidence from multiple examiners](#), Journal of Law, Economics and Organisation 37(3), 2021.

Annex 2: Further analysis

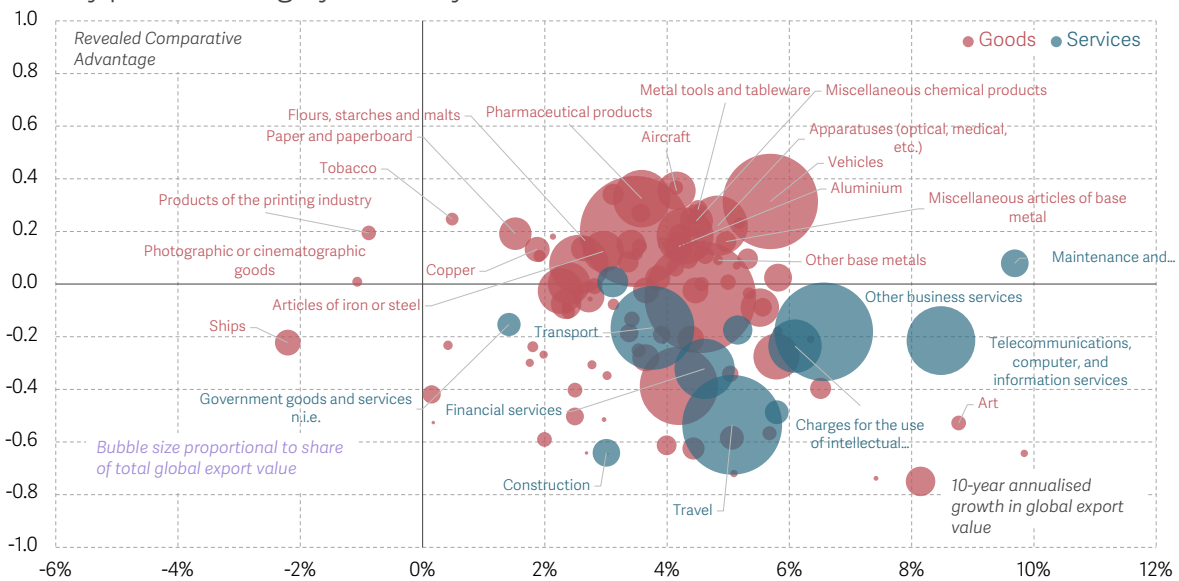
Trade

FIGURE 39: The UK is specialised in services in value added terms
Evolution of revealed comparative advantage in trade in value added of top 10 sectors of 2019: UK 1995-2018



SOURCE: Analysis of OECD, Trade in Value Added, 2021 Edition.

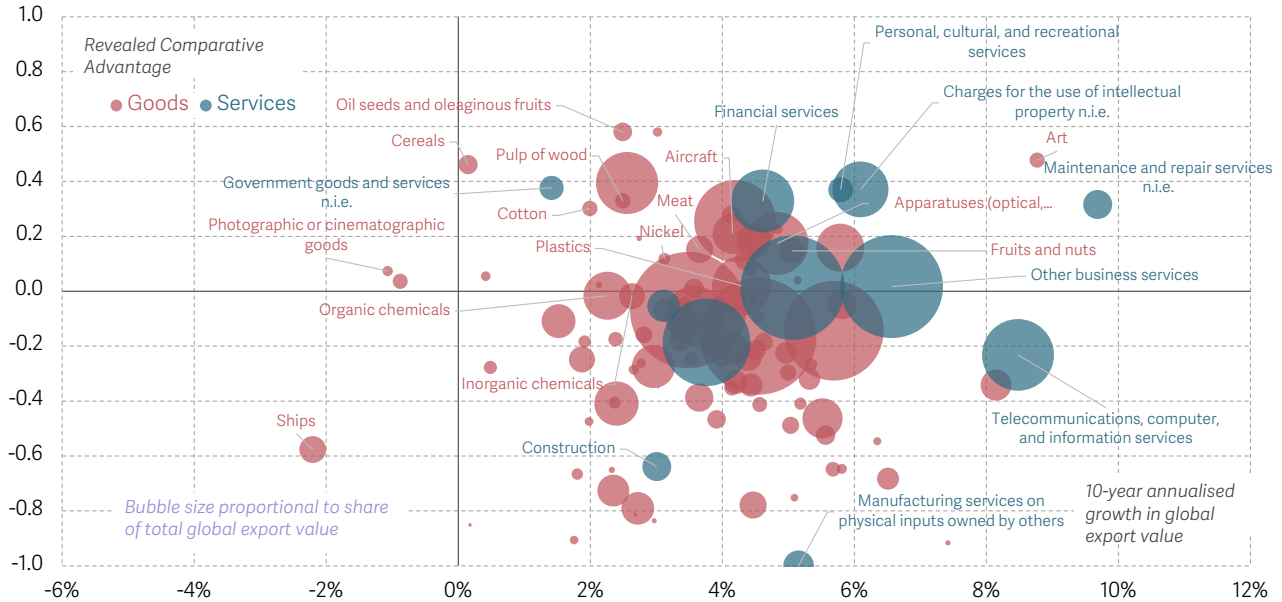
FIGURE 40: Germany is specialised in many large goods categories
Revealed comparative advantage and 10-year annualised growth in global export value, by product category: Germany, 2019



NOTES: The horizontal axis measures compound annual growth rates of volumes between 2009 and 2019. The vertical axis shows the revealed comparative advantage in 2019. The size of the bubbles corresponds to each product's share in world trade in 2019. The abbreviation n.i.e. stands for 'not included elsewhere'.
SOURCE: Analysis of Harvard Growth Lab, Atlas of Economic Complexity (HS version) and OECD-WTO, Balanced Trade in Services.

FIGURE 41: The United States is specialised in a range of large goods and services

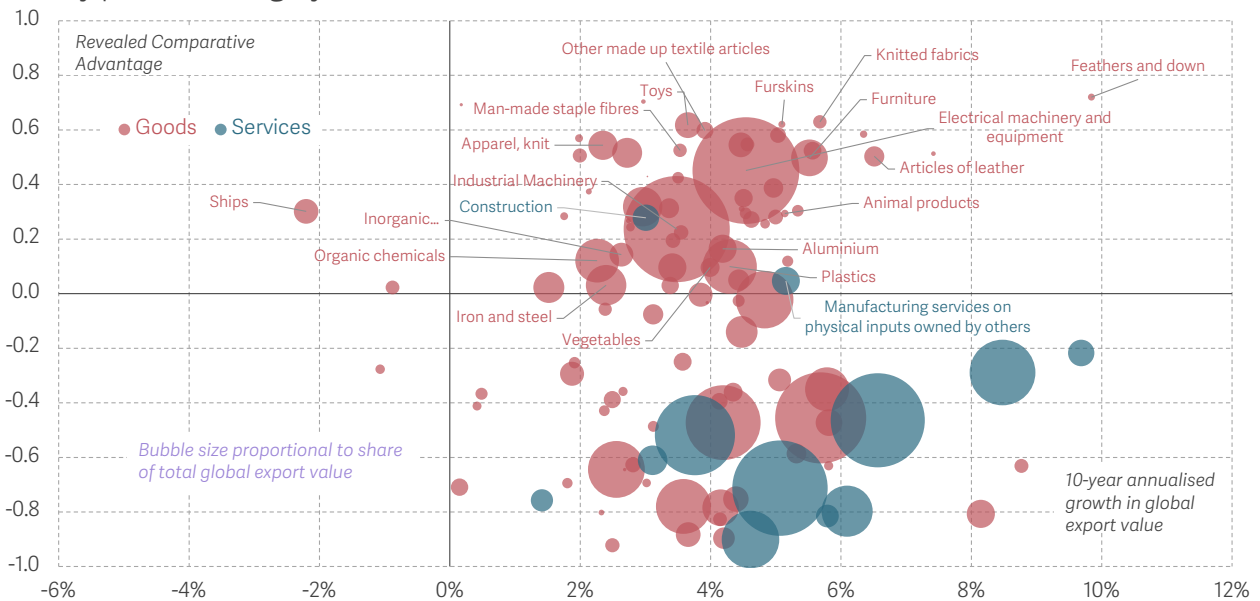
Revealed comparative advantage and 10-year annualised growth in global export value, by product category: USA, 2019



NOTES: The horizontal axis measures compound annual growth rates of volumes between 2009 and 2019. The vertical axis shows the revealed comparative advantage in 2019. The size of the bubbles corresponds to each product's share in world trade in 2019. The abbreviation n.i.e. stands for 'not included elsewhere'.
SOURCE: Analysis of Harvard Growth Lab, Atlas of Economic Complexity (HS version) and OECD-WTO, Balanced Trade in Services.

FIGURE 42: China is specialised in production of goods

Revealed comparative advantage and 10-year annualised growth in global export value, by product category: China, 2019

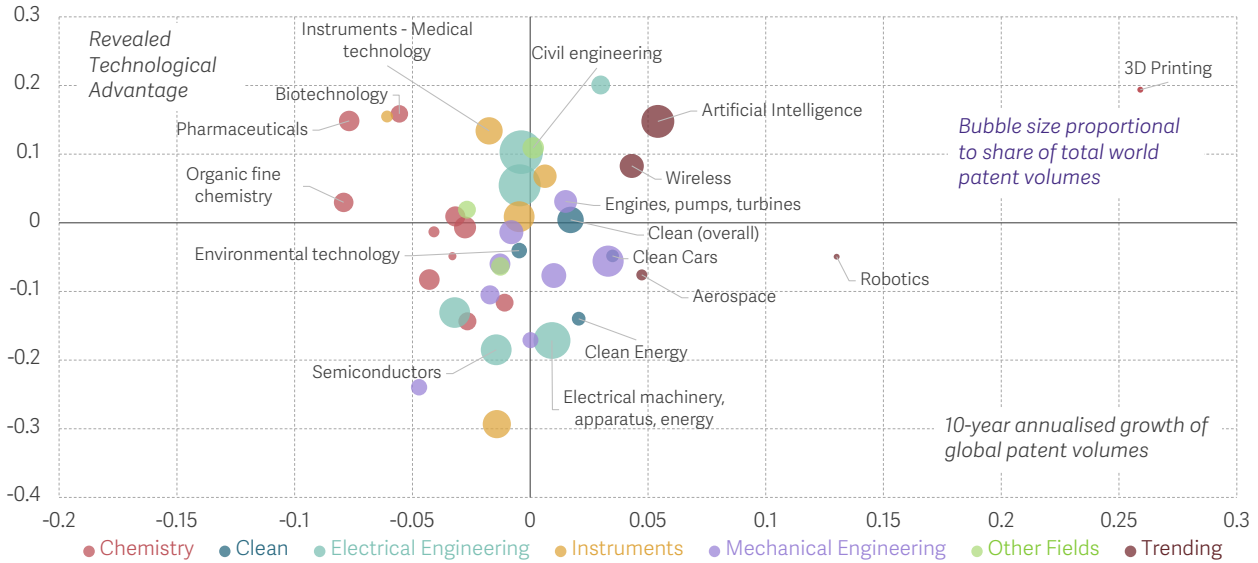


NOTES: The horizontal axis measures compound annual growth rates of volumes between 2009 and 2019. The vertical axis shows the revealed comparative advantage in 2019. The size of the bubbles corresponds to each product's share in world trade in 2019. The abbreviation n.i.e. stands for 'not included elsewhere'.
SOURCE: Analysis of Harvard Growth Lab, Atlas of Economic Complexity (HS version) and OECD-WTO, Balanced Trade in Services.

Patents

FIGURE 43: Germany innovates in mechanical engineering technology classes

Revealed Technological Advantage by broad technology categories: Germany, 2015

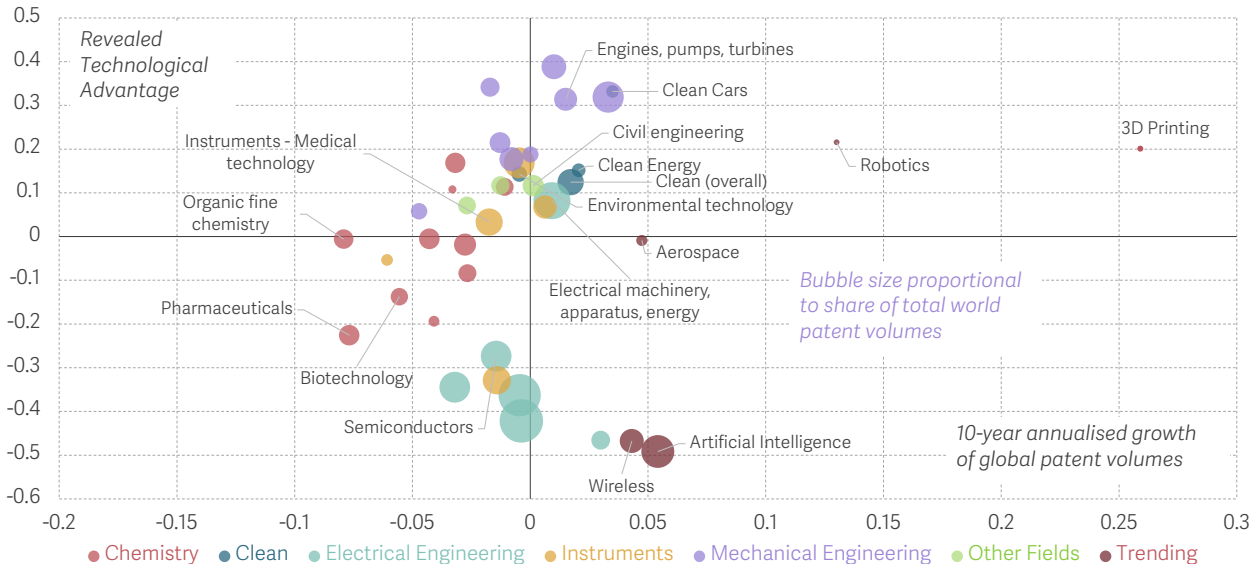


NOTES: The vertical axis denotes the RTA bounded between -1 and 1, the horizontal axis represents the 10-year annualised growth for broad technological categories, and the size of the bubbles represents the share of the technological category in overall patenting activity in 2015. Clean (Overall) includes all patents under the CPC class “Y02” i.e., climate change mitigation technologies. These also include patents under the other technology categories such as clean cars, environmental technology and clean energy.

SOURCE: Analysis of PATSTAT 2018, Spring edition.

FIGURE 44: The US has an advantage in innovation related to AI and wireless

Revealed Technological Advantage by broad technology categories: US, 2015

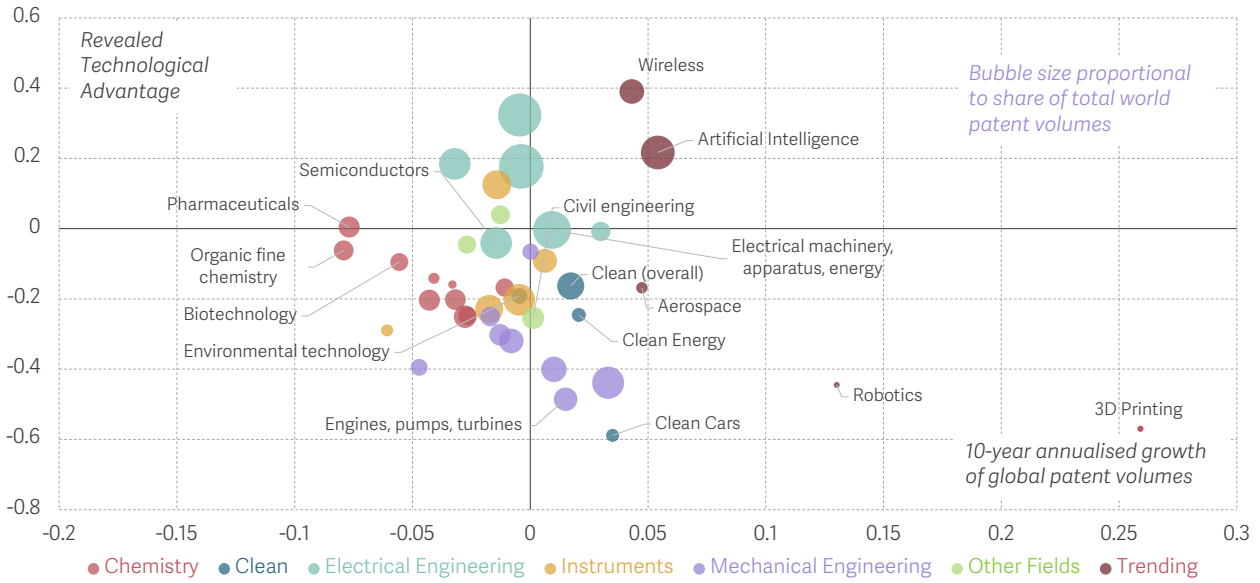


NOTES: The vertical axis denotes the RTA bounded between -1 and 1, the horizontal axis represents the 10-year annualised growth for broad technological categories, and the size of the bubbles represents the share of the technological category in overall patenting activity in 2015. Clean (Overall) includes all patents under the CPC class “Y02” i.e., climate change mitigation technologies. These also include patents under the other technology categories such as clean cars, environmental technology and clean energy.

SOURCE: Analysis of PATSTAT 2018, Spring edition.

FIGURE 45: China innovates in some trending technologies and in electrical engineering

Revealed Technological Advantage by broad technology categories: China, 2015



NOTES: The vertical axis denotes the RTA bounded between -1 and 1, the horizontal axis represents the 10-year annualised growth for broad technological categories, and the size of the bubbles represents the share of the technological category in overall patenting activity in 2015. Clean (Overall) includes all patents under the CPC class "Y02" i.e., climate change mitigation technologies. These also include patents under the other technology categories such as clean cars, environmental technology and clean energy. SOURCE: Analysis of PATSTAT 2018, Spring edition.

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