Natural partners

Building a comprehensive UK-India knowledge partnership

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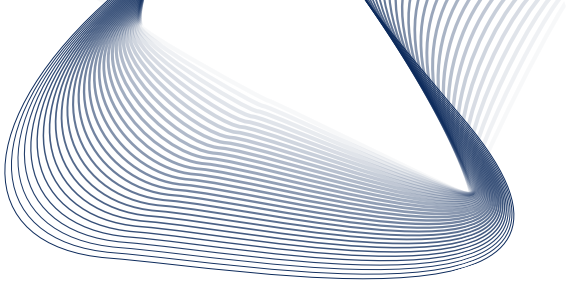
Executive summary



Earlier this year, in *The China question: managing risks and maximising benefits from partnership in higher education and research*,[1] we identified significant dependencies on China within the UK higher education sector and research system.

That paper proposed both institution-level and system-level mechanisms to map, monitor and mitigate these dependencies, calling for greater and more purposeful diversification of the UK's international higher education and research relationships.

In this companion report, we undertake a similar mapping exercise of our education and research relations with India, the one country whose demographics and economic potential could enable it to become a knowledge partner for the UK of equivalent importance.

That may seem today far-fetched. India's contribution to numerous fields of knowledge, from astronomy to mathematics, is undoubted. Its role, more recently, in software development and, through its diaspora, in the growth of tech hubs such as Silicon Valley, is legendary.

But the country remains far from fulfilling its potential in international education and the modern global research endeavour.

While China is positioning itself to challenge the US for supremacy at the top of the science and innovation pyramid, and is actively engaged in international collaboration as part of that strategic move to achieve technological dominance, India is far behind in the rankings of global knowledge economy powerhouses.

From a UK standpoint, China is today a far more significant collaborative partner in education and research. It sends by far the most students to the UK of any country in the world and is poised to overtake the US as the UK's most important research partner, having surged from ninth to second place in the space of a decade.

While Indian student numbers in the UK are today rising again, after years of decline, they still represent less than half of those from China. India is also progressing more slowly up the rankings of the UK's science partners, moving from 22nd to 16th place over the same period.

This paper looks at how the UK could deploy its knowledge assets – notably its universities and its research base – in a more strategic way with India and proposes the formation of a "comprehensive knowledge partnership" as the centrepiece of a post-Brexit UK-India free trade agreement.

It provides evidence to support increased funding of research collaboration with India, which would accelerate its rise up the ranks of the UK's R&D partners, and makes a number of significant policy recommendations to transform the relationship in higher education.

This comprehensive knowledge partnership should be at the heart of the 21st century relationship between India and the UK – countries that are in many ways natural

partners and ones whose economic ties seem at lower risk of geopolitical disruption than the UK's ties with China.

With India overshadowed by China as a force in the global knowledge economy and looking to develop its capabilities at pace, and with concern mounting in the UK at growing dependencies on China within the higher education and research system, this initiative meets clear needs in both countries.

The proposed comprehensive knowledge partnership should have five building blocks:

1. Signature of a UK-India mutual recognition of credits and qualifications treaty that enables students to move seamlessly between institutions in the two countries.

2. An ambitious goal for the doubling of student numbers from India over the life of this parliament, supported by moving India to the low-risk country list, monitoring of the need for further liberalisation of the post-study work visa and measures to protect the integrity of the visa system.

3. Launch of an authorised and sector-backed loan funding programme for Indian students that both widens access to UK higher education and reduces risk of fraud and predatory lending.

4. Steps to ensure the UK's Turing Scheme supports a more balanced partnership in international education with India, with more UK students studying at Indian institutions.

5. Provision of significantly increased funding and support for collaborative R&D that promotes frontier science.

Introduction

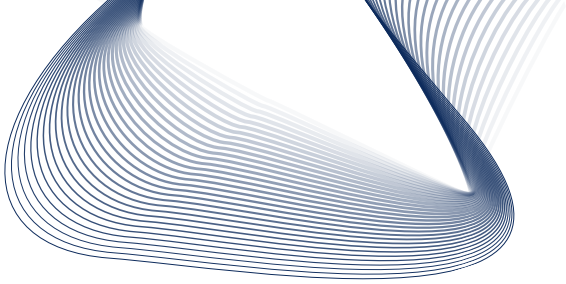
This is a companion paper to the February 2021 report *The China question: managing risks and maximising benefits from partnership in higher education and research*. That identified significant dependencies on China within the UK higher education (HE) sector and research system and proposed both institution-level and system-level mechanisms to help key stakeholders understand and manage significant sets of risks.

One of its key recommendations was for the UK government, research funding agencies, higher education regulators, sector representative bodies and universities to take a more purposeful and proactive approach to diversification. This paper aims to contribute to that process by assessing the potential for and necessary steps to bringing about an intensification of higher education and research ties with India.

If there is one country today with the human capital and economic potential to equal China, and to become a knowledge partner of comparable importance for the UK, it is India. Although the two Asian giants both have immense educational, economic and scientific potential, their relationship to the UK, and to many other nations of the world, differs dramatically. The sheer number of potential flashpoints with a newly assertive techno-authoritarian China means that the risk-weighted probability of some kind of geopolitical disruption to what has been a rapidly developing UK-China knowledge economy relationship is material. A deterioration in diplomatic relations that brings with it some degree of economic decoupling between China and western democracies is a real possibility, with unknowable ramifications for international education, open science and internationally collaborative research. A structural breakdown in relations with India, the world's largest democracy, is, by contrast, almost inconceivable.

The UK and India have long shared interests and democratic values that underpin their modern relationship, enabling them to work together to tackle Covid, to combat climate change and fight extremism. Yet commentators on the post-Cold War UK-India relationship have long looked for a "game-changer" that would spark life into bilateral ties and enable them to fulfil more of their huge promise.[2] For in crucial respects, the bilateral relationship has been something of a disappointment. The "prosperity" agenda supposedly sits at the heart of it, according to the Foreign Commonwealth and Development Office.[3] Yet judged by the crucial trade yardstick, for example, the two countries have become relatively less important to each other over time, slipping down the rankings of the other's trading partners. The UK is now the 14th most important trading partner for India, having been second in 1998-1999.

As with the proverbial London buses, one waits a long time then two game-changing events with the potential to transform the UK-India relationship have come along at once. The pressing urge in New Delhi and London to forge a qualitatively different relationship is being driven by a pair of new and important geopolitical factors: on the one hand, the emergence of a more assertive China and, on the other, the need in the UK to develop new strategic partnerships on the world stage post-Brexit, which embody the Global Britain idea and highlight the advantages of leaving the European Union. Viewed from both London and New Delhi, this is therefore a critically important moment for UK-India relations. There is a real intensity to the relationship



and desire to make things happen that is definitely new and palpable to seasoned observers of Delhi-London dynamics.

The rise of a techno-authoritarian China has forged a strong consensus in western capitals that boosting India's capabilities is in the geostrategic interests of all democracies, a view that Delhi has strongly encouraged. While India and China were at the same level of economic development in the 1970s, contrasting growth rates over successive decades have left India facing the uncomfortable prospect of becoming a second-rank actor in a Sino-centric and unipolar Asia. Against the backdrop of lethal clashes with China on its contested border in the Himalayas in the spring of 2020 and the US withdrawal from Afghanistan in summer of 2021, India sees itself – with justification – as the last country left standing up to China in South Asia. Faced with this formidable adversary, India is moving rapidly away from its traditional stance of non-alignment and strategic autonomy and becoming less hesitant around its membership of geopolitical groupings such as the Quadrilateral Security Dialogue with the United States, Japan and Australia.

Although not yet looking for actual alliances, India is more openly reaching out to friendly western countries and seeking support in bolstering its military, technological and scientific capabilities. From the perspective of the Indian strategic elite, middling powers such as the UK, but also Japan, Australia, Indonesia, Korea and others, can be useful partners in the face of China's assertiveness.[4] Many of them share India's uneasiness at China's growing economic and military power, its wolf-warrior diplomacy and recent aggressiveness on multiple fronts. The pattern set by Beijing's crackdown in Hong Kong, human rights abuses in Xinjiang and border incursions in Arunachal Pradesh and Taiwan has prompted a fundamental re-evaluation of the risks of allowing a China-designed Asian order to establish itself unchallenged. India's ability to forge closer relations with these fundamentally well-disposed mid-sized countries will be critical to its ability to balance China in the region and prevent the consolidation of a Sino-centric geopolitical dispensation inimical to its interests.

Like its comprehensive strategic partnerships with the US and EU, India's relations with the UK have a dimension that goes beyond security. The UK is important as a significant potential source of capital, technology and knowledge resources that could meaningfully contribute to the rapid development of India's capabilities. As part of this process, the Indian government is overhauling its trade strategy, to move beyond protectionism and to engage more with the rest of the world. India and the United Kingdom are launching negotiations on a free trade agreement (FTA), with the goal of an early harvest agreement by March 2022. As a down payment towards it, in May 2020, the two governments announced the Enhanced Trade Partnership, as well as the Roadmap 2030, a plan to revitalise bilateral ties by removing trade barriers on key sectors such as agriculture, healthcare, education, and social security, and pave the way for a comprehensive strategic partnership (CSP) between India and the UK.

On the UK side of the relationship, this work towards an FTA and CSP will help flesh out the idea of Global Britain post-Brexit, which has seen India and the wider Indo-Pacific region accorded a central role in UK strategic thinking. In March 2021, the government set out its security, defence, development and foreign policy and its vision of the UK's role in the world over the next two decades in *Global Britain*

in a Competitive Age: the Integrated Review of Security, Defence, Development and Foreign Policy.[5] This set out a "tilt to the Indo-Pacific", which was quickly thereafter reflected in the UK's first deployment of the HMS Queen Elizabeth aircraft carrier strike group to the Indo-Pacific, and in the UK's role in the AUKUS alliance. Rather than looking at the UK's potential contribution – likely modest – as a net security provider to the Indo-Pacific, however, this paper instead looks at the far greater impact that the UK can have as a net knowledge provider to India, the most important regional player in the Indo-Pacific after China.

This paper examines how such a comprehensive knowledge partnership could provide a much-needed focus for efforts to deepen bilateral ties. It explores how the UK could deploy its knowledge assets – notably its universities and its research base – in a more strategic way with a country destined by its sheer size to play a crucial role in the geopolitics of the 21st century. The first section of the paper focuses on the contribution that the UK, through its universities, can make to human capital formation in India, home to the world's largest youthful population under the age of 25, representing over 600 million people.[6]

India's "demographic dividend" has the potential to be the country's main source of economic growth over coming decades, but whether it fulfils that potential depends in large part on raising average levels of educational attainment. Completing upper secondary education has become a minimum requirement for young adults navigating the modern economy. Yet the share of 25- to 34-year-olds who leave school without completing upper secondary education is higher in India than in any country in the world, at just over two-thirds,[7] compared with an OECD average of 15 per cent. To bank its demographic dividend, India will need to make a significant investment in opportunities for young people to raise their average levels of educational attainment. On average across OECD countries, 39 per cent of adults have tertiary attainment, with levels of over 50 per cent or more in Canada, Ireland, Israel, Luxembourg, Korea, the Russian Federation and the United States. India in this company is a laggard.

The new National Education Policy (NEP), personally promoted by Prime Minister Narendra Modi, proposes major reforms to address India's human capital challenges. Among its many objectives – the bulk of which focus on primary and secondary education – it aims to improve the quality of domestic higher education institutions (HEIs), ensure that India is recognised as a global education hub, and double the gross enrolment ratio in higher education (including vocational education) from 26.3 per cent in 2018 to 50 per cent by 2035. This goal for gross enrolment is a challenging one. As there is not capacity within India's own higher education system to accommodate demand from those who do complete secondary education and want to embark on tertiary studies, additional places will be required on a huge scale. To create enough university and college places for one in two school leavers will mean significant expansion of the sector and a massive increase in its seat capacity.

Recent growth in HE enrolment has not been matched by increases in public expenditure. That imbalance is having a negative impact on quality and student experience, as well as on learning outcomes and employability. Teacher-pupil ratios are roughly twice what they are in the UK and US, for example, while only 2 per cent of India's 40,000 HEIs offer PhD programmes, thereby limiting opportunities for

students to continue studying at higher levels.[8] The employability of Indian graduates has declined over the last three years, according to the *2021 India Skills Report*, with less than half of Indian graduates considered by employers surveyed to be highly employable resources. Notwithstanding the extraordinary success of the Indian Institutes of Technology (IITs) in churning out CEOs for no end of Fortune 500 tech companies, no Indian university features in the top 100 QS rankings for graduate employability.[9] [10]

The NEP sees the bulk of the new higher education capacity to be achieved by consolidating and substantially expanding existing HEIs. At the same time, universities will undergo structural change. As a result of the NEP reforms, many will end up very different to how they look today, becoming bigger and more multi-disciplinary. The vision is for a broader, less siloed and more multi-disciplinary undergraduate experience in institutions that are themselves multi-faculty entities spanning the full-spectrum of academic disciplines. To facilitate this, the NEP proposes to agglomerate these large multidisciplinary universities and colleges within HEI clusters or "knowledge hubs", each of which will aim to have 3,000 or more students. Moving to large multi-disciplinary universities and creating HEI clusters will be a challenging reorganisation of the structure of Indian higher education. The plan is for all institutions to aim to be multi-disciplinary by 2040, which means a phasing out of single-stream specialist universities.

The NEP also envisages HEIs systematically offering more flexible study options, with the idea that students will be able to dip in and out of study and store credit in a new and yet-to-be-established Academic Bank of Credit. Undergraduate degrees will be a default four years, but students will have the choice of a three-year option. Those who complete the first year of a three-year degree leave with a certificate, those who complete two years leave with a diploma, and those who do three years leave with a degree. If all this is implemented, India will be well on its way to unlocking the benefits of a fully flexible system of credit accumulation and transfer between institutions. Overseeing this new system will be a powerful new HE regulator – the Higher Education Commission of India – which will subsume the University Grants Council, the All India Council for Technical Education and the National Council for Teacher Education.

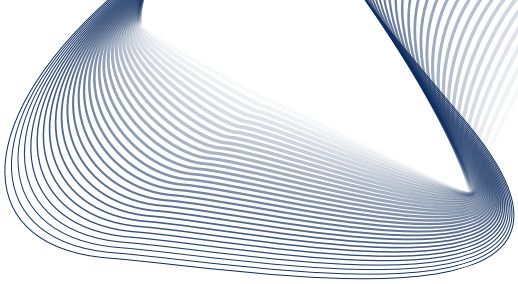
The NEP has the potential to be a landmark policy. Pratap Bhanu Mehta, the distinguished academic and author, has observed that if the Modi government "does little else but implement most of the recommendations on school education and empower India's school children, the future will belong to India".[11] Yet its implementation cannot be taken for granted. In the meantime, domestic constraints in education provision are one of the push factors behind outbound student mobility and help explain both why India is the second-largest sending country of globally mobile students, with around 500,000[12] pursuing learning opportunities overseas each year, 10 times more than the 49,000 students it welcomes from other countries.[13] In sharp contrast to the way in which China has made education a central part of its Belt and Road Initiative and become the world's fourth largest recipient of international students, India is lagging far behind in this metric of global soft power, entirely absent from the list of top 15 destination countries.

In recognition of this acute supply-side bottleneck in domestic provision, the NEP also proposes measures to liberalise India's regulatory environment for foreign education provision on Indian soil. It aims to attract universities from among those ranked in the global top 100 to set up branch campuses and other kinds of tie-ups with local institutions. Implementation of the NEP cannot be assumed, however, with the bill allowing foreign universities to establish themselves in India yet to complete its passage through parliament. When similar measures have been proposed in the past, they have encountered both domestic opposition and limited enthusiasm from western institutions concerned about the cost of establishment, the difficulty of repatriating revenues, formidable regulatory barriers at multiple levels of government and threats to institutional autonomy and academic freedom, and have consequently stalled.

In addition to the supply-side factors pushing up demand from Indian students for higher education overseas, our research suggests that a mix of economic factors influences Indian students' ability to access higher education in the UK. The primary focus in this chapter is on the policy and economic factors that influence the take-up of opportunities for study in the UK, including the availability of post-study work opportunities, gold prices in India, foreign exchange rate values, movements in the Indian equity markets, the availability of private loan finance and policy developments in India's education loan schemes. All influence Indian students' levels of outward mobility to the UK and also have an impact on where in the UK they will choose to study.

The second part of this paper examines the existing bilateral research relationship. We provide an overview of the development of UK-India research ties and assess each country's relevance to the other as collaborative partners. As with the previous China paper, this will be measured principally in terms of numbers of collaborations and the impact of work produced together in terms of "category normalised citation impact" (CNCI). Citations to academic papers accumulate over time at a rate that is discipline-dependent, and CNCI "normalises" the citation count for each document by comparing it with the global average for the set of similar documents published in the same year and in the same field or subject category. This section examines some of the challenges facing India in seeking to catch up with China's daunting lead over it in collaborative research and development, as well as technology innovation.

While China is powering its way up the rankings of the UK's research partners, moving from ninth to second place, behind only the US in the space of a decade, the same cannot at present be said of India. Progress is slower: although India is not in the UK's top 10 by volume for co-authorships, it has risen from 22nd in 2012 to 16th. This paper provides evidence to support the allocation of increased funding to research collaboration with India, which would accelerate India's rise up the ranks of the UK's R&D partners. Its collaborative research with the UK is not only of higher average CNCI than the UK's overall research average – strikingly, since 2010, it has also been of higher average CNCI than the UK's collaborative research with China. This is driven in part by highly collaborative multilateral papers on which India is a co-author among many and China is not. Such papers attract high citation counts, but also highlight India's general acceptability as a research partner, which is what enables it to be part of these large international collaborations.



A shared commitment to promoting academic freedom will be essential to the success of any comprehensive knowledge partnership. India's liberal universities have frequently found themselves at odds with the nationalist administration of the Bharatiya Janata Party, which has been accused of interfering in key university appointments and blocking roles for high-profile critics such as historian Ramachandra Guha[14] and economist Amartya Sen.[15] [16] Sustained repression of academic freedom will have inevitable implications for the potential to develop new partnerships with India. It restricts the choice of Indian partners, can reduce the autonomy of those partners, and can circumscribe the subjects that are open for international collaborative research, especially in the social sciences. The recent, subsequently withdrawn, guidance requiring academics to obtain prior clearance from India's Ministry of External Affairs to hold international webinars on topics touching on India's security, internal issues and other subjects the government regards as sensitive, is just one example.[17]

Enhancing India's overall research capacity and increasing the internationalisation of the country's university system is a key goal of the NEP. Prime Minister Modi in January 2020 described "a need a need to revolutionise the landscape of Indian Science Technology and Innovation". Initiatives to this end include a commitment to increase gross expenditure on research and development from 0.7 per cent of GDP to 2 per cent; the establishment of a new national funding agency, the National Research Foundation; and the publication of a draft science, technology and innovation policy.[18] This aims to promote "technology self-reliance and indigenisation", to double the number of researchers and spending on R&D every five years, and to see India recognised as one of the top three scientific superpowers in the next decade. The UK has a clear interest in fulfilling its potential to become a first-rank knowledge partner for India as it works to achieve those objectives.

Five building blocks of a UK–India comprehensive knowledge partnership

A primary goal of this analysis is to identify some of the key building blocks the UK must put in place, often in partnership with India, to enable the comprehensive knowledge partnership. This section classes those building blocks into five categories.

1. Sign a UK-India mutual recognition of credits and qualifications treaty

The two countries should sign a treaty for an ambitious student mobility programme that creates and makes fully operational a groundbreaking system for the mutual recognition of academic credits and qualifications. This should support the government of India's initiative to promote the internationalisation of Indian HEIs and the UK government's policy to promote both the outward mobility of UK students and the UK as a destination for Indian students. It would turbocharge the work of the existing Joint Taskforce on Mutual Recognition of Qualifications, creating a secretariat with a strong political mandate to remove formidable regulatory obstacles to two-way mobility. The secretariat should aim to eliminate significant blockages around the mutual recognition of qualifications, enabling students to seamlessly transition between India and the UK.

This work should extend well beyond the existing focus on the narrow issue of India's non-recognition of the UK's one-year master's degree. It should also ensure recognition of courses delivered online and at distance, as well as, critically, the creation of mechanisms for the recognition of credits, modules and other sub-qualification units of study. It should involve the business and professional recognition groupings that control whether holders of particular qualifications have a right to practise in their respective countries. This would ensure that the proposed Academic Bank of Credit planned in India works seamlessly with the Credit Accumulation and Transfer Scheme that is used by many universities in the UK to monitor, record and reward passage through modular degree courses, and to facilitate movement between courses and institutions. A treaty establishing an integrated system of credit accumulation and transfer, accompanied by the mutual recognition of qualifications by regulators, governments and professional bodies, would be a critical enabling measure for the creation of the proposed new UK-India knowledge partnership.

On its own, however, it will have little impact unless institutions in both countries actually make use of it in practice. The practical difficulties to overcome in putting together such a scheme are immense, and without political commitment progress is unlikely. At the moment, credit transfer arrangements are at relatively immature stages of development within both countries and almost entirely non-existent between the two. This will require the governments of both to take a strategic view of the importance of stimulating international credit transfer between the UK and India. Within the framework of the proposed treaty, the two governments should operate a scheme to promote credit transfer arrangements between institutions. This scheme could have a funding stream embedded within it to kickstart the programme in its early stages. This could take the form of a payment to HEIs for credits from institutions in the other country that they voluntarily choose to recognise as comparable in quality and standards to their own courses.

Among the many obstacles to overcome will be the government of India's university rankings-based approach to the question of which international institutions can operate in India. There is an emphasis in the NEP on facilitating entry into the Indian market only of "selected universities" such as "those from among the top 100 universities in the world". The UK has a number in this category, with 11 in the top 100 of the Times Higher Education (THE) World University Rankings. But there is arguably a shortage of Indian partners in that bracket of the international rankings. India's highest ranked institution – the Indian Institute of Science (IIS), Bangalore – is in the 301-350 bracket, its second highest is in the 351-400 range, and the next 15 are in the 601-800 category. It is welcome that more recent draft policy documents talk of foreign institutions in the top 200 and 500 of the THE or QS World University ranking. This is likely to provide more of an overlap of UK and Indian institutions, but a move away from institutional rankings altogether – a key ask of Universities UK International – as a way of assessing institutional strengths would facilitate greater collaboration with UK HEIs and align with India's social and economic priorities.[19]

A well-understood disadvantage of global rankings is that they place significant weight on research outputs, denying those universities focused on teaching the recognition they may deserve. International ranking systems also produce institution-level hierarchies that provide little insight into the quality of teaching and student outcomes on individual courses. While there is no overlap in the rankings between India's top universities and the UK's – there are 37 UK HEIs in the top 300, ahead of IIS, Bangalore, in the 301-350 band – there may be more of an overlap between what the UK and leading Indian institutions are offering at a course level. For example, a UK university that does not fall into the top 100 at an institution level may comfortably be in it for particular specialisms. Rather than narrowing the funnel of potential collaborations with the NEP's requirement that overseas institutions be ranked in the global top 100, both governments should use the FTA to enable recognised institutions to forge partnerships in light of their own assessment of their complementary strengths and likely mutual benefits.

2. Use Turing to support a more balanced partnership in international education

The UK-India relationship in international education is at present highly imbalanced, with over 300 times as many Indian students studying in the UK each year as UK students studying in India: 53,000 vs just 173.[20] This is part of a bigger problem, which is that relatively few UK students study abroad, even though those who do consistently have stronger academic and employment outcomes than those who do not – an outperformance more pronounced for students from less advantaged backgrounds. Just 7.8 per cent of students in the 2016-17 graduating cohort who responded to a Destination of Leavers from Higher Education survey were internationally mobile for a period of just one week or more. Of this modest number, barely one per cent spent time studying in India.[21]

Raising what are shockingly poor levels of Asia literacy should be a vital component of the UK's Indo-Pacific strategy. Recent efforts to encourage UK students to study in India have failed quite spectacularly to achieve their objectives. Generation UK-

India, which was intended to be a large-scale outward mobility programme, was launched by the British Council in November 2014, with the aim of encouraging up to 25,000 young people from the UK to gain professional and academic skills and experience in India over the following five years. It folded after a year, apparently because of risks involved around student safety and duty of care responsibilities.

In the wake of this debacle, a number of relatively modest efforts have been made to revive outbound student mobility to India under the UK-India Education and Research Initiative (UKIERI). Under a pilot scheme launched in 2019, around £1 million was awarded to UK and Indian universities to fund them to deliver 40 short-term mobility programmes for over 600 UK students in summer 2020 and winter 2020/21. The Covid-19 pandemic, however, prevented any of the selected programmes from going ahead in person as planned, and the funding awarded was returned.

Virtual equivalents of 12 of the 40 originally selected programmes were jointly delivered by UK and Indian universities in winter 2020/21, supported by grant funding from the UK and Indian governments totalling over £60,000. Over 500 students from 11 UK universities and 10 Indian universities participated. Participating UK universities reported that the opportunity to jointly design and deliver a virtual experience strengthened their strategic relationships with their Indian partner universities, according to Universities UK International.

The UKIERI Phase 3 extension year (to March 2022) is providing a final opportunity for the original UK and Indian university grant recipients to deliver the mobility programmes for which they were awarded funding in 2019 before the end of the current phase. Over £400,000 of funding from the UK and Indian governments is being (re-)awarded to universities so that nine of the original 40 selected programmes can be delivered in winter 2021/22, with up to 165 UK students expected to participate, Covid-19-related restrictions allowing.

Following the UK's decision to leave the European Union's Erasmus+ programme, the government has launched its own "global programme to study and work abroad", the Turing Scheme. This is intended to "contribute to the Government's commitment to a Global Britain, by helping organisations enhance their existing international ties and forge new relationships around the world". The first funded placements began at the start of the 2021-22 academic year, with 1,002 students choosing to go to India through the scheme. India was the ninth most popular destination, attracting 3.5 per cent of participants and a little over half of the number that chose to study in second-placed China.[22]

The UK needs to be strategic in how it deploys Turing funding. It is vital that Turing represents an improvement upon Erasmus+ as a mechanism for facilitating student mobility to key knowledge partners and plays a meaningful role in enhancing levels of India literacy in the general UK population. The UK should aim in the medium term – by 2030 – for 20 per cent of funding for the Turing Scheme to support mobility to India, a move that should send a clear signal of its intent to make the flow of students between the two countries less imbalanced. This would be a target rather than a quota, allowing Turing to remain a demand-led programme driven by student choice,

but one that should be supported with funding to pump-prime partnerships and develop the capacity on the Indian side to deliver this scale of opportunity.

3. Set an ambitious near-term goal on Indian student enrolment: double their numbers over the life of this parliament

The International Education Strategy aims to increase the value of UK education exports to £35 billion per year and the number of international students hosted in the UK to at least 600,000 per year by 2030. This represents a modest increase of just over 10 per cent on current numbers, as in 2019/20 there were 539,000 international students studying in the UK. Of these, 143,000 were from the EU and 396,000 were non-EU. Some 139,000 Chinese students make up the largest cohort, more than two and a half times the 53,000 from India.

India is the most important of the five priority countries for the UK's International Education Strategy. It was a desire to improve the relationship with India that was a major driver behind the 2019 change in visa policy, which has helped turn around several years of decline. Indian student numbers coming to the UK have been on a rollercoaster because of the policy whipsaw on post-study work. They fell from roughly 39,000 in 2010 to 15,000 in 2016, before rising in anticipation of the visa change to 26,000 in 2018 and then to 53,000 in 2019/20.

The government's strategy rightly recognises that at the same time as driving growth in international student recruitment overall, it is also essential that it is from a diversified base, in order to remain sustainable in the long term. The UK should aim to reduce dependence on Chinese students by diversifying student flows to the UK, with the goal of doubling those from India within the lifetime of this parliament and attracting at least 100,000 students from India per year by 2025. Indian students are particularly sensitive to the duration of post-study work opportunities, and if the UK is to capitalise on one of the few industries in which it still leads the world, it needs to ensure that its offer remains competitive vis-à-vis other destinations for study.

As other destinations start to open up to international students following the pandemic, the UK should make sure to keep the competitiveness of the UK's post-study work visa under review, so that it matches the best in the world. It should take note of the competitive landscape beyond the traditional English-speaking destination countries. In 2015, for example, all Indian students studying in France became eligible for a post-study work permit valid for up to five years. This saw its average annual enrolment growth rate nearly double to 15.6 per cent in the period 2015-2019, compared with an average annual enrolment growth rate of 8.5 per cent in the prior five-year period between 2010 and 2014.

While the UK's current annual enrolment growth rate is higher than this, the market is dynamic and the government should be prepared to take further liberalising steps if necessary to ensure rapid progress towards the 100,000 students targeted for 2024/45. The government should be particularly attentive to any evidence that international students seeking to take advantage of the post-study work visa are struggling to

be taken on as employees under the scheme because of the limited duration of the visa. The Department for Education and the Home Office, working with the new Office for Talent in 10 Downing Street, should commission a study of the barriers to employment facing international students on graduation.

Separately, the UK should be ambitious for the delivery of transnational education (TNE) in India, and set a bold target of reaching 100,000 students in India through TNE by 2025, compared with the 8,500 TNE students in India in 2019/20. Achieving such a target in this timeframe will depend on the detail of the new TNE framework and India's recognition of online learning. Supporting TNE would contribute to India's efforts to build up the capacity it needs to meet its 50 per cent participation target by 2035. As part of the FTA negotiation, as discussed above, the UK should push India to modify the emerging University Grants Commission (UGC) policy that would allow only UK universities in the top 200 globally ranked universities to set up branch campuses in India and only those UK universities that are in the global top 500 globally ranked universities to benefit from automatic approval in joint degree, dual degree and twinning programmes, with the rest subject to a likely laborious, time-consuming and uncertain approval process administered by the UGC Commission.[23]

To be consistent with free trade principles, India should be pressed to allow all recognised UK higher education providers an equal opportunity to establish themselves in the country, either with branch campuses or via joint degree, dual degree and twinning programmes, not just those 11, 28 and 59 UK institutions that happen at the moment to feature respectively in the top 100, 200 and 500 of the most recent THE World University Rankings.[24] As part of the FTA, it will also be vital for the UK, after more than a decade of discussion at all levels, to secure recognition of the UK's one-year postgraduate degrees. India's refusal to recognise these qualifications limits the scope for bilateral research collaborations, as PhDs in STEM subjects require a two-year master's in India, so those who have completed one-year master's degrees in the UK are unable to start PhD studies in India.

For its part, the UK should agree in the FTA to include India, alongside China, in the Home Office's low-risk country category.[25] India's exclusion from this list has been a longstanding source of irritation in the bilateral relationship – and been seen as a form of discrimination. The issue has been the UK's need to secure the integrity of its visa process against a backdrop of fraud and malpractices either not detected by or originating in the in-country recruitment agent network used by many universities. In return for including India on the low-risk list – which has the benefit of enabling faster processing times for applications from the country, a crucial factor in securing enrolments of students who might otherwise go elsewhere – UK universities should be required to adopt more rigorous measures to drive out fraud and abuse in the recruitment process. The targeted increase in student recruitment from India brings with it heightened risks that the sector will need to manage carefully if it is to avoid a policy backlash of the kind that led in 2011/12 to the removal of the post-study work visa.

UK Visas and Immigration (UKVI), working with the Office for Students (OfS), should ensure all universities wishing to recruit international students have put

in place robust systems for verification of academic credentials, authentication of language tests and proof of financial means. There is a real opportunity for UKVI to improve both the robustness and speed of evidence-checking through technology. This would make the UK more competitive, safer from fraud and could, if designed properly, reduce the burden on the student. UKVI should also assist universities in identifying where in-country recruitment agents are failing to identify fraud, or even themselves engaged in malpractices, by publishing visa refusal rates by recruitment agent. As a further push to clamp down on fraud in the in-country recruitment agent system and as part of its duty to uphold the reputation of higher education in England, the OfS should publish a code of practice governing universities' use of recruitment agents and sub-agents.[26] Compliance with such a code should be enforceable as a condition of registration with the OfS.

4. Provide funding to Indian students that is essential to assure quality and sustainability and require

To ensure that student flows from India of the size targeted in this report are sustainable, they must be de-risked for universities. One of the principal risks arises from the change in the UKVI refusal threshold to less than 10 per cent in 2014, which resulted in some universities effectively stopping active recruitment in parts of India and other countries with relatively high refusal rates as they couldn't risk their Tier 4 licenses. Universities became partly responsible for lower recruitment from parts of India through active choice, driven by the policies of the Home Office. As a consequence, many thousands of legitimate Indian students who might have come to the UK for study did not apply because of reduced recruitment activity by British universities in countries with relatively high visa refusal rates.

An important factor in many visa refusal decisions is concern that students lack funds to support themselves in the UK. Fraudulent practices by rogue agents providing funds on a very short-term basis in order to assist students to meet the finance expectations, and possibly recycling the same funding to assist multiple students, are commonplace. This is an area that requires considerable attention from UKVI and also a willingness to learn from other countries that have put in place mechanisms to manage this risk. The UK should consider adopting a similar approach to Canada's Student Direct Scheme, which provides a fast visa processing time to students who can prove they have purchased from a recognised bank a Guaranteed Investment Certificate of CAN$10,000. Students can draw down on this deposit to cover living expenses over the course of their first year of studies.

Another way to de-risk recruitment would be to stimulate the provision of international student loan funding in the UK. Indian students will secure easier access to study loans that do not require them to provide collateral or secure co-signers in the US and Canada than they will in the UK. Students with strong potential for postgraduate success can access loans that do not require a co-signer or collateral.[27] The slow development of this kind of lending is a competitive disadvantage for the UK higher education system, as it effectively requires students intending to study in the UK to pay for their studies up front or to take loans from commercial banks

or moneylenders that are in many cases guaranteed by their families using gold and other assets as collateral.

Universities UK International should establish an international student finance taskforce to consult on steps the sector could take to provide better loan finance options for international students. These could include authorising recognised banks to offer a fully commercial loan, which could potentially be delivered via the Student Loan Company at no financial risk to the UK taxpayer.

UUKi should also consult on mechanisms to enable universities – if they wished – to act as co-signers of a student's loan application. This would reduce the risk of the loan to the financial institution, lower the cost to the student and align universities with the career outcomes of their international students. To do so would be to give the universities a direct financial interest in ensuring their international graduates secure well-paid jobs that enable them to pay back more of their debt sooner – and create a virtuous cycle for their own international recruitment efforts in the future.

5. Support collaboration in R&D to promote frontier science

The UK is India's second most frequent research collaborator, and India's most frequent European collaborator. But it cannot afford to be complacent that this will continue to be the case and must relentlessly work to position itself as the country India wants to partner with in cutting edge R&D.

UK Research and Innovation (UKRI) should strategically grow the scale and scope of system-to-system funding agreements with leading agencies in India such as the new national funding agency, the National Research Foundation, as well as existing bodies such as the Medical Research Council.

The UK's R&D base is not big enough to partner every country in every area and remain at the global forefront. Choices need to be made. They must reflect the UK's broader "science superpower" ambition as we need to choose carefully who we partner with internationally, and in what areas, so that our partnerships meet our scientific as well as diplomatic, defence, trade and other interests.

This paper provides evidence to support increased funding of research collaboration with India, which would accelerate its rise up the ranks of the UK's R&D partners. Its collaborative research with the UK is not only of higher average impact than the UK's own average research – strikingly, since 2010, it has also been of higher impact than the UK's collaborative research with China.

New cash is certainly needed to enable enhanced partnership with India at any scale. The government also needs to compensate for cuts to Official Development Assistance-funded science that have affected programmes in India delivered through the Newton Fund by scaling up other mechanisms for international research collaboration.

The main instrument now available – the UKRI Fund for International Collaboration, a £160 million pot – is far too small and spread far too thinly across the globe to make a difference.[28] It needs to be replaced with a funding instrument that is at once significantly more substantial, more strategically focused, and more long-term, dependable and stable.

A £1 billion fund – with a significant portion available for joint match-funded programmes with key countries such as India – would have significantly more impact and be a more credible commitment to support the UK's goals of maintaining and reinforcing its position as a global science superpower.

The UK and India demonstrably gain in research quality from their existing joint endeavours, and a mutual commitment to increased match-funding would provide a sound starting point for targeted, selective growth of partnerships between leading institutions focused on areas of economic and technological priority.

1. Student mobility, supply, and demand between the UK and India

India is home to the world's largest population under the age of 25 (over 600 million)[29] and the second-largest sending country of globally mobile students, while the UN projects India will overtake China in 2027 as the most populous country.[30] India's "demographic dividend" is set to be the main source of economic growth over the coming decades. However, to fully utilise its demographic capital, a significant investment in opportunities for young people is required. The country's National Education Policy targets a 50 per cent participation rate in tertiary education by 2035. To accelerate this movement, significant steps in liberalising India's regulatory environment for foreign education provision are tabled but are yet to take place. Domestic constraints in education provision are one of the push factors behind outbound student mobility.

In addition to the supply-side factors impacting student demand from India, evidential data suggests that a mix of economic factors influence Indian students' ability and accessibility to pursue higher education in the UK. The primary focus in this chapter is on policy and economic factors that influence this trend.

Trends and policy drivers of the UK's competitive position among globally mobile Indian students

Student demand from India for global higher education has grown steadily over recent decades. This section analyses policy and economic influences on student demand from India and studies how student demand for UK education has evolved.

Supply-side factors impacting student demand from India

Here we present a timeline of international education policy changes in the UK and map it against the mobility of Indian students. Such policy changes include national marketing campaigns, student visa policies and post-study work opportunities, the launch of bilateral research initiatives, and policies impacting higher education institutions recruiting international students.

One of the earliest international education policy changes in the UK was the introduction of tuition fees for international students in the early 1980s. Initially, there was a backlash from the Commonwealth countries in response to the policy. However, over time, it incentivised institutions to grow their international student numbers. The UK's flagship scholarship programme, Chevening, was set up in 1983 to counteract negative perceptions of the UK as a study destination and reduce the impact of the newly introduced tuition fees on international student demand.

The domestic higher education regulatory landscape further stimulated international student recruitment. There was a significant expansion of the number of HEIs under the Higher and Further Education Act 1992. The introduction of student number controls for home students in 1994 and underfunded expansion of higher education incentivised international recruitment. Higher education institutions could grow their international student numbers unrestrictedly, while the domestic recruitment was limited within the allocated number controls. Over the years, international students'

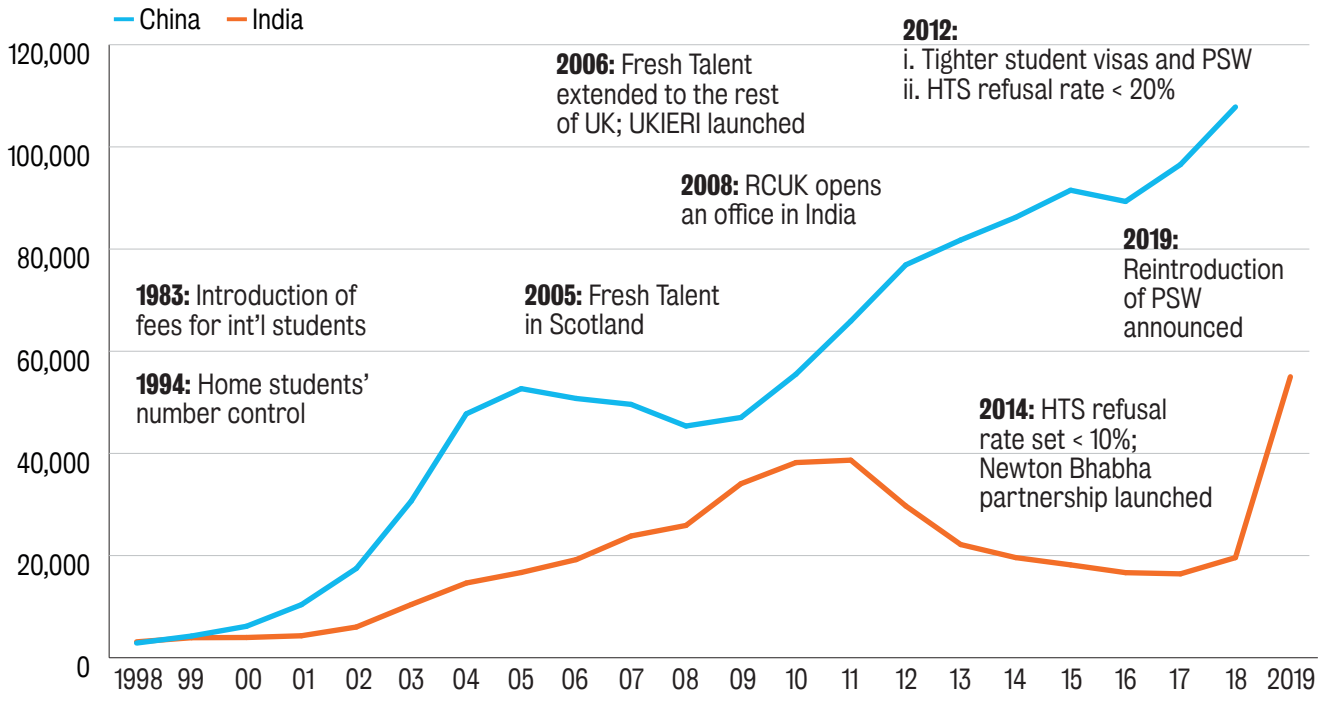
tuition fees made up the gaps in funding for home students and became an important cross-subsidy for research.

In parallel, the British Council established the Education Counselling Service in the mid-1980s to support universities' overseas recruitment activities. National education marketing campaigns were run under two consecutive Prime Minister Initiatives between 1999 and 2011. And, in 2005, Scotland implemented the Fresh Talent initiative, which enabled international students at Scottish HEIs to work in the UK upon graduation. The rest of the UK introduced post-study work opportunities for international students in 2006. This accelerated global student demand for UK study.

Finally, the removal of the post-study work route was announced in 2011[31] and implemented in 2012. Student demand from India peaked in 2011, followed by continuous declines over the following seven years. The downward trend reversed in 2018 and peaked again in 2019, most likely because of the announcement that the post-study work route was to be reintroduced.

Figure 1 compares student demand from India and China. It shows that pressure on student recruitment from India was mounting from all sides: HEIs were discouraged from recruiting from countries with high visa refusal rates that might push them beyond the thresholds the Home Office introduced in 2012. On the other hand, price-sensitive students, whose post-study work (PSW) options would have enabled them to repay their study loans at home, were disincentivised to study in the UK once the post-study route was discontinued. In contrast, demand from China remained policy-neutral throughout the past two decades.

Figure 1: International student demand from China and India for UK higher education[32]



Source: Data extracted on 19 Apr 2021 20:38 UTC (GMT) from UIS.Stat.

Table 1 details the main policies and initiatives that would have generally impacted international students, particularly India. The table pays special attention to UK-India bilateral relations.

TABLE 1: POLICY EVENTS IMPACTING STUDENT AND RESEARCH ENGAGEMENT WITH INDIA[33]

Date	Policy details
1981	Introduction of tuition fees for international students. While in the long term, this created commercial incentives to recruit international students, in the short term, it created a backlash from Commonwealth countries.
1983	Chevening – award funded by the Foreign, Commonwealth and Development Office and partner organisations. Since 1983, over 50,000 Commonwealth scholars and professionals have studied Chevening Scholarships and Chevening Fellowships in the UK.
1984	British Council establishes the Education Counselling Service to support universities' overseas recruitment activities. 72 subscribing education institutions.
1992	HE expansion (from 52 HEIs in 1992) under 1992 Further and Higher Education Act. The number of players in international education is expanding.
1994	Introduction of student number controls for home students. This policy further incentivises international recruitment by growth-minded institutions seeking to increase their student numbers.
1999	National marketing campaign under the Prime Minister Initiative (PMI) aimed at international student recruitment. Strong focus on China.
2006	Second PMI with the following strands:
	• UK positioning and diversification of markets to reduce dependence on a small number of countries.
	• Ensuring the quality of the student experience.
	• Developing strategic partnerships.
2005	The Fresh Talent initiative in Scotland created considerable interest among Indian students in Scottish HEIs.
2006	Post-study work opportunities extended to the rest of the UK devolved nations.
2006	Launch of the UK-India Education and Research Initiative.
2008	Research Councils UK (now UK Research and Innovation) opens office in Delhi. An impact evaluation of the RCUK-India relationship reports significant growth of the bilateral portfolio from £1 million to over £300 million in co-funded research and innovation programmes comprising over 200 individual projects, with over 175 UK and Indian research institutions and more than 100 industry partners.[34]
2011	A Home Office review revealed "widespread abuse" of the student visa system, which resulted in a significant tightening of the rules. The end of the PSW route was announced, and education institutions recruiting students were required to hold "highly trusted sponsor" status.[35]
2012	Highly trusted sponsors' refusal rate set at 20 per cent.
2014	Highly trusted sponsors' refusal rate set at 10 per cent.
2014	Newton Bhabha partnership is established, which brings together UK and Indian researchers to cooperate on global challenges. Capacity building is a critical strand of the partnership and includes (i) Newton International Fellowships – support for early-stage post-doctoral researchers for two years at a UK research institution; and (ii) PhD Placements – an opportunity for the UK and Indian PhD scholars to spend a period of their study (two to six months) in Indian and UK higher education institutions.[36]
2019	The UK government announces new International Education Strategy: global potential, global growth. The Strategy is updated in 2021.[37]
2019	Cross-party support for the reintroduction of the two-year post-study work visa for international students, and in September 2019 the move is announced.[38] [39] The policy change is implemented in 2021.
2021	Enhanced UK-India trade partnerships, including cooperation in educational services and concluding the work on the recognition of UK higher education qualifications.
2021	Special Young Professionals scheme to allow young Indian and British professionals to work and live in each other's country for two years.[40]

To better understand the demand from India, in this table, mobility to the UK is compared with the mobility of Indian students to Australia. PSW policies caused similar responses from the demand side. Post-study work visas in Australia were abolished in 2009 and caused a reduction in the number of Indian students. Declines reversed in 2013 when the post-study work visas were reintroduced. The UK followed the same demand pattern during the period from 2011 to 2018.

Case study: demand from India for higher education in the UK and Australia

Both the UK and Australia enjoyed a steady growth in the numbers of Indian students in the early 2000s. The numbers to Australia peaked in 2009, whereas those in the UK peaked in 2011.

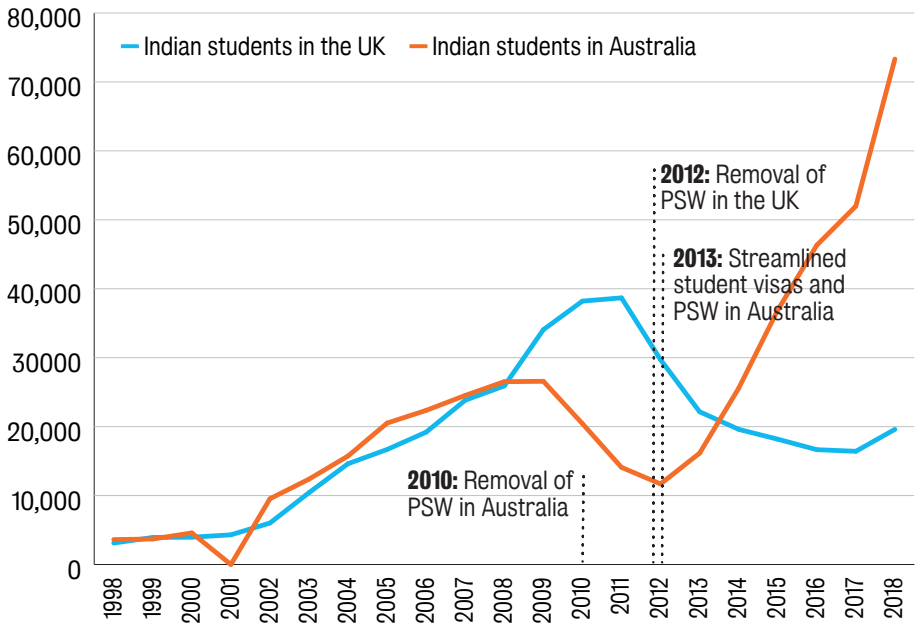
Both countries were affected by the global financial crisis. Rising unemployment was blamed on liberal immigration policies. The media reported violence against Indian students in Australia in 2009, which attracted widespread criticism in India. Indian students responded immediately, and demand bounced back the following year. Tighter visa rules were introduced in Australia, and the post-study work route was removed in 2010. Significant reductions in the student numbers led to Knight's "Strategic Review of the Student Visa Program", published in 2011.* All 41 recommendations were accepted and led to streamlined study visas, allowing for post-study work in 2012.

In the UK, the removal of post-study work was announced in 2011 and introduced in 2012. This resulted in continuous declines in the number of students from India studying in the UK. A minor increase was noted in 2018, followed by significant growth in 2019, when post-study work was reintroduced.

Figure 2 below shows student mobility divergence between the two countries. Removal of the post-study work visas caused significant reductions in the number of Indian students in both countries. This signals that students have little loyalty to the respective study destinations but are highly responsive to the post-study opportunities they offer.

Figure 2: Indian students in Australia and UK 1998-2018

Source: UIS data. Data extracted on 19 Apr 2021 20:38 UTC (GMT) from UIS. Stat.



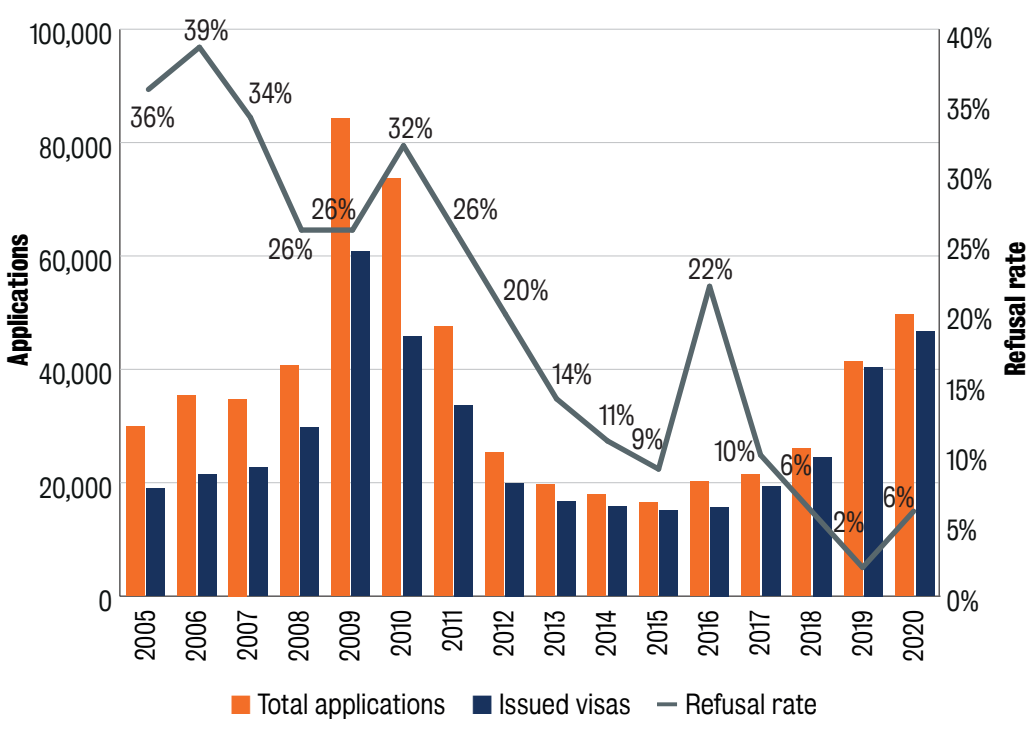
Impact of student visa policies and post-study work opportunities on demand from India

Changes in immigration policies impacted both students from India and education institutions. The student visa data includes all levels of study in the UK. A significant number of students from India would have been seeking to study at low-cost private education institutions. The student visa applications peaked in 2009 and reached 84,271. The lowest number of student applications was in 2015, when their number was 16,520.

Declines in the number of visa applications in the five years to their lowest point in 2015 are most likely attributed to the discontinued post-study work route in the UK. The high levels of refusal rates leading to 2010 did not impact the volume of applications, which signals the attractiveness of post-study work on the one hand and low-cost education options offered by private education institutions on the other.

There was a significant increase in student applications in 2019, which continued through 2020. This contrasts with the declines in student demand from India seeking to study in the US and Australia.

Figure 3: Outcomes of UK study visa applications from Indian students

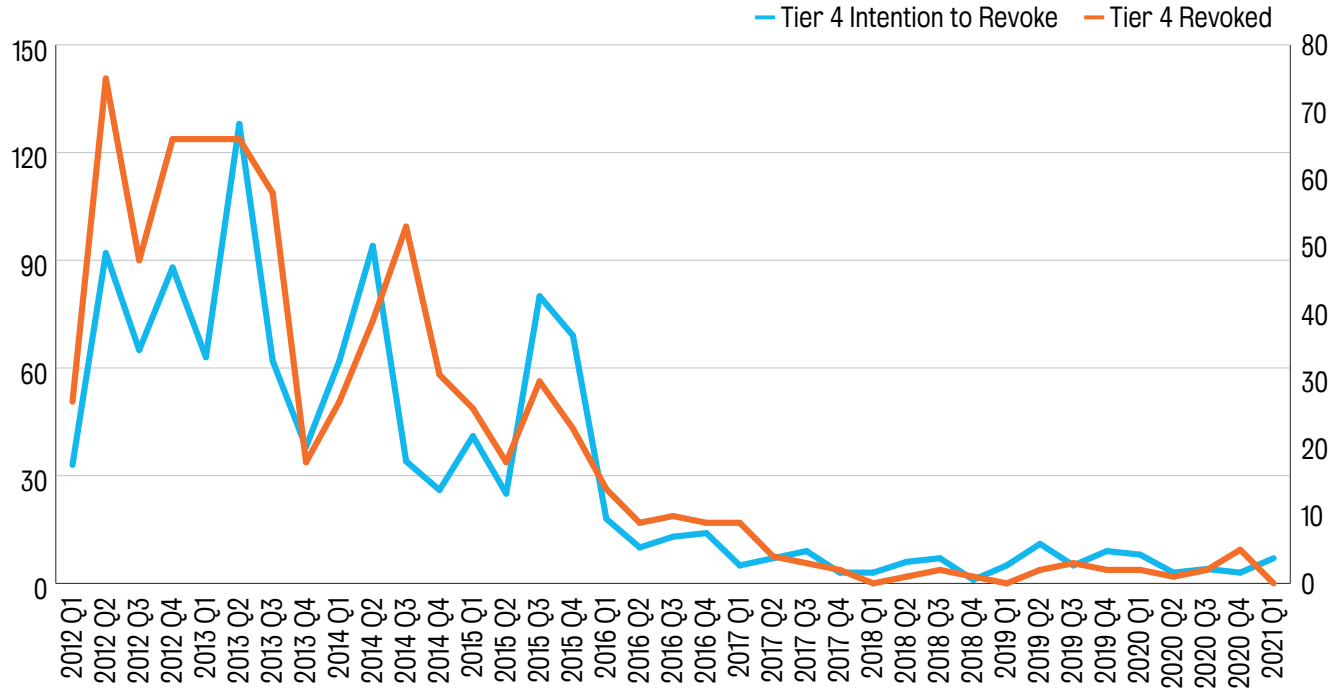


The tighter student immigration policies equally impacted the education provision. One of the significant changes introduced in 2011 linked student visa applications to the education institution students were applying to. All education providers were thus required to apply for "highly trusted sponsor" status. This was replaced by "Tier 4 sponsor status" in April 2015. The refusal rate for institutions with Tier 4 sponsorship status was set to 20 per cent in 2012. The permitted refusal rates for institutions with highly trusted sponsor licence changed in 2014 and set to less than 10 per cent. This

reduced interest in recruitment from countries with double-digit student visa refusal rates like India, Pakistan, Nigeria, and other countries in South Asia. An unintended consequence of this policy was a shift in student recruitment towards low-risk countries regarding visa refusals, such as China and other countries in East Asia.

Figure 4 shows Home Office actions taken against Tier 4 sponsors. Almost half of the actions took place in 2011 and 2012 (48 per cent; actions impacted 303 education establishments). A Freedom of Information request revealed that most of the affected institutions (90 per cent) were private institutions of further education.

Figure 4: Impact of student visa policy on education providers: institutions with a revoked license to recruit international students



Source: Home Office (2021) UK Visa & Immigration Transparency Data Q1 2021.

TABLE 2: TYPE OF INSTITUTIONS WITH REVOKED OR SUSPENDED LICENCE

Type of education establishment	Private institutions with revoked/ suspended license	Public institutions with revoked/ suspended license	Total
Higher Education Institution (HEI)	4	8	12
Overseas Higher Education Institution	8	1	9
Private Institution of Further or Higher Education	541	18	559
University	10	38	48
Grand total	**563**	**65**	**628**

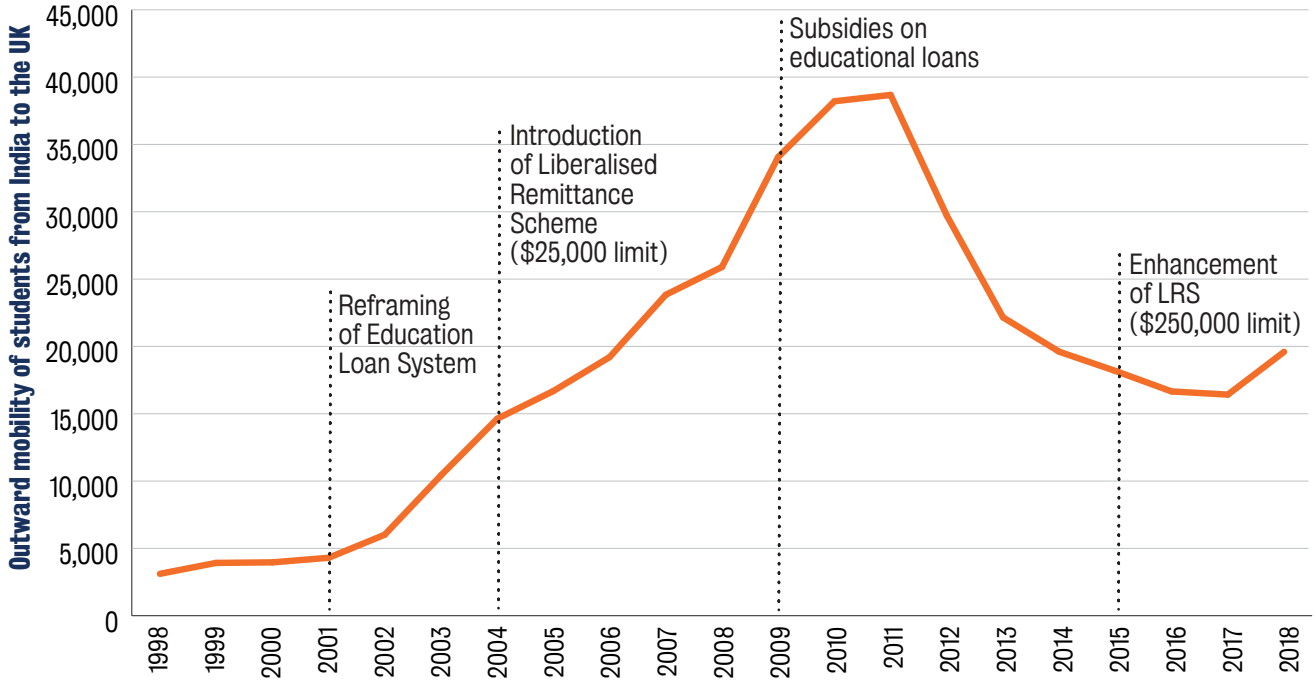
Source: FOI Home Office; Data extracted on 07/07/2021.

A 2017 Office for National Statistics review carried into Home Office estimates that 100,000 international students overstay their visas each year concluded the estimates were "potentially misleading". The proportion of overstay was likely to be around one per cent (around 1,500 students).[41]

Demand-side influences on student enrolments from India

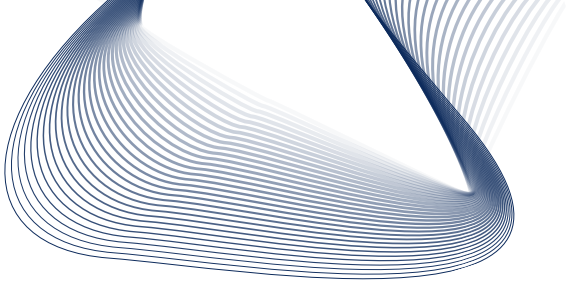
Indian student demand for global higher education has increased over recent years. The price sensitivity of Indian students to the international higher education market was highlighted by the British Council[42] and in subsequent policy reports.[43 44] Described in the literature as "highly price-sensitive" and "value-maximisers",[45 46] the Indian students are affected by economic factors determining household liquidity. An analysis presented in the Appendices explores those economic influences, such as fluctuations in the exchange rates and the price of gold, that may have further contributed to the declines in Indian demand for UK education.

Figure 5: Timeline of Indian policies and student mobility to the UK



The education loan system in India has changed over the years and has evidently impacted student demand for higher education overseas. As noted earlier, the decline In Indian students in 2012 is attributed to the discontinued post-study work route in the UK.

Increasingly, private lenders, in addition to some banks, are offering specialised loans to international students.[47 48] The advantage such lenders bring is that no collateral or co-signer is required. While the practice is expanding in the US and Canada, such loan facilities are not available to international students in the UK. The significantly greater access to finance that international students in the US have as compared with



those coming to the UK may also influence the outbound Indian student numbers to the UK.

Unlike other countries, economic parameters in India significantly affect the willingness of Indian students to pursue their higher education. Along with economic impacts and policy changes, Indian students faced the highest level of visa refusals in 2012. Sensex was not very high in that year, gold prices fell, and the GBP rate between 2009-2012 increased significantly. Due to the increasing economic pressures from the demand side and the additional policy changes from the supply side, the outward mobility of Indian students to the UK decreased significantly between 2011 and 2018. In addition to the increase in exchange rates, in 2012 the tighter student visas for international students and restricted PSW played a significant role in decreasing student numbers. Due to economic factors, an increasing number of Indian students could not meet the visa requirements for financial support, which explains the high visa refusal rates. The impacts of PSW changes would have mainly affected students with lower financial means to support their education, alongside other underlying economic constraints in the country.

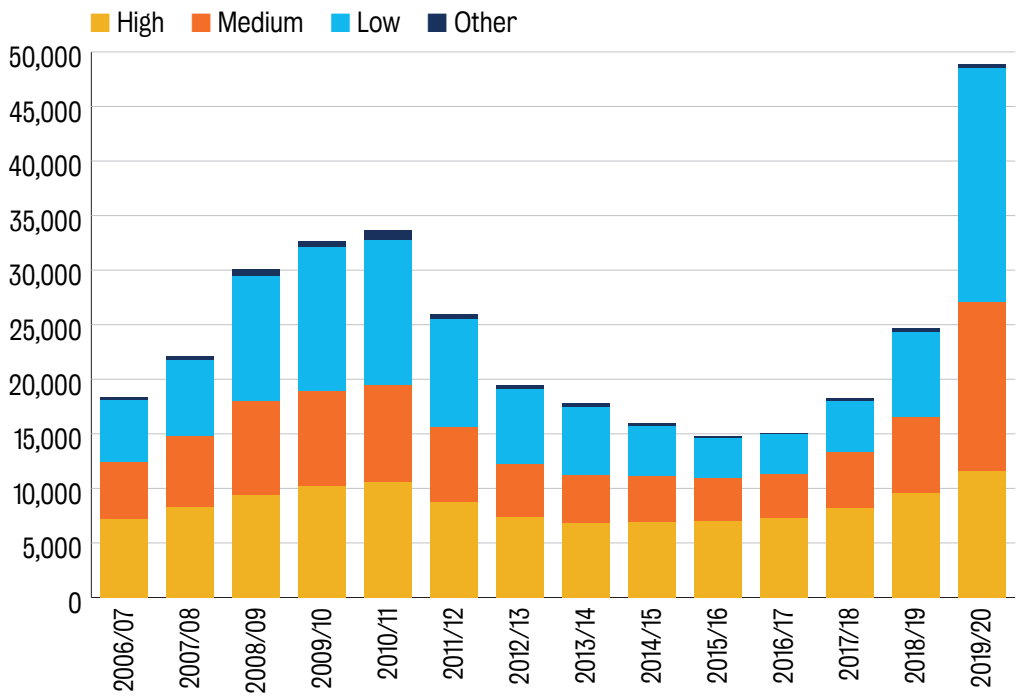
The reinstatement of the post-study work visa in July 2021[49] provided a boost to the UK as a study destination for Indian students. Data from IDP Connect shows the announcement of the reopened PSW route in the UK resulted in 47 per cent increase in web searches in India for UK study between 12 and 30 September 2020, compared to all searches throughout the previous year (10 September 2018 and 9 September 2019).[50] Another indicator signalling a rebound in student demand from India was the UK student visas statistics, which showed a 102 per cent increase in issued visas in September 2021 compared to the previous year (90,669 Indian nationals were granted sponsored study visas) and a 197 per cent increase compared to September 2019.[51]

International student flows from India to the UK by type of institution, level and subject of study

Distribution of Indian students by type of higher education institution in the UK

The demand from Indian students shows significant changes over time by level of study and the type of UK HEI. The type of HEI is determined according to their UCAS tariff. The UK higher education sector is therefore segmented as containing high, medium and low-tariff HEIs.[52]

Figure 6: Distribution of Indian students in the UK

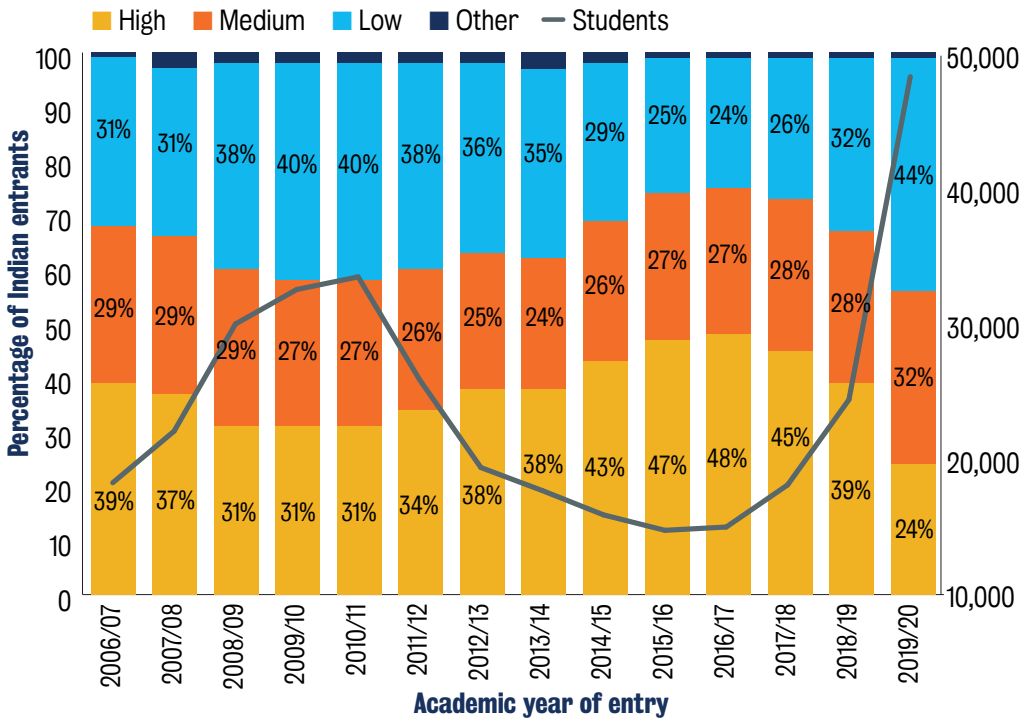


Source: HESA data according to institutions' UCAS tariff.

Most of the increases in students between 2008/09 and 2010/11 occurred in the low-tariff HEIs. While the student numbers across all types of HEIs increased, the concentration of students in low-tariff HEIs was the highest. The proportion of students in low-tariff HEIs grew from 31 per cent in 2007/08 to 40 per cent in 2010/11. The continuous decline in Indian students between 2011/12 and 2016/17 impacted the low-tariff institutions significantly – the proportion of students dropped from 40 per cent to 24 per cent in 2016/17. Presumably, this also reflects the exposure of these institutions to the Indian market and the impact of the 10 per cent refusal threshold for the highly trusted sponsors.

The most pronounced increases in student demand, following the announcement about the post-study work route reinstatement, happened in the low-tariff institutions. The proportions of Indian students reached their highest level of 44 per cent in 2019/20, followed by 32 per cent for medium-tariff HEIs. These results support the findings in the section above that student demand from India is price-sensitive, influenced by the availability of scholarships and post-study work opportunities. The low-tariff HEIs are assumed to charge lower tuition fees compared to high-tariff institutions. As such, discontinued post-study work visas would have most impacted students with limited financial means.

Figure 7: Proportions of Indian students in high-, medium- and low-tariff HEIs



Comparing the HEIs that are most popular with Indian students to those popular with Chinese students presents an interesting contrast. The majority of Chinese students are concentrated in the UK's most selective institutions.

Figure 8: Top 20 UK HEIs with the largest number of students from India

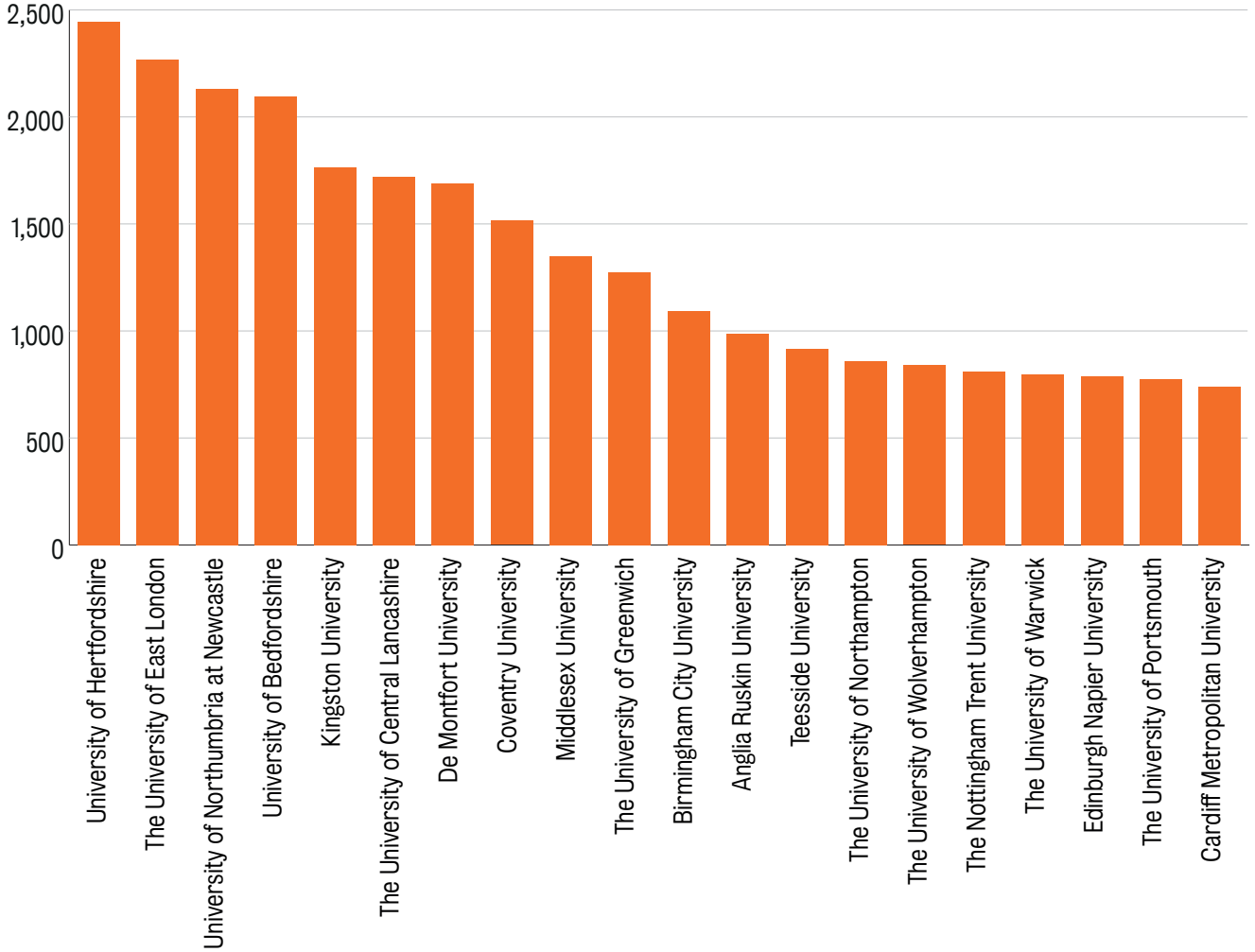
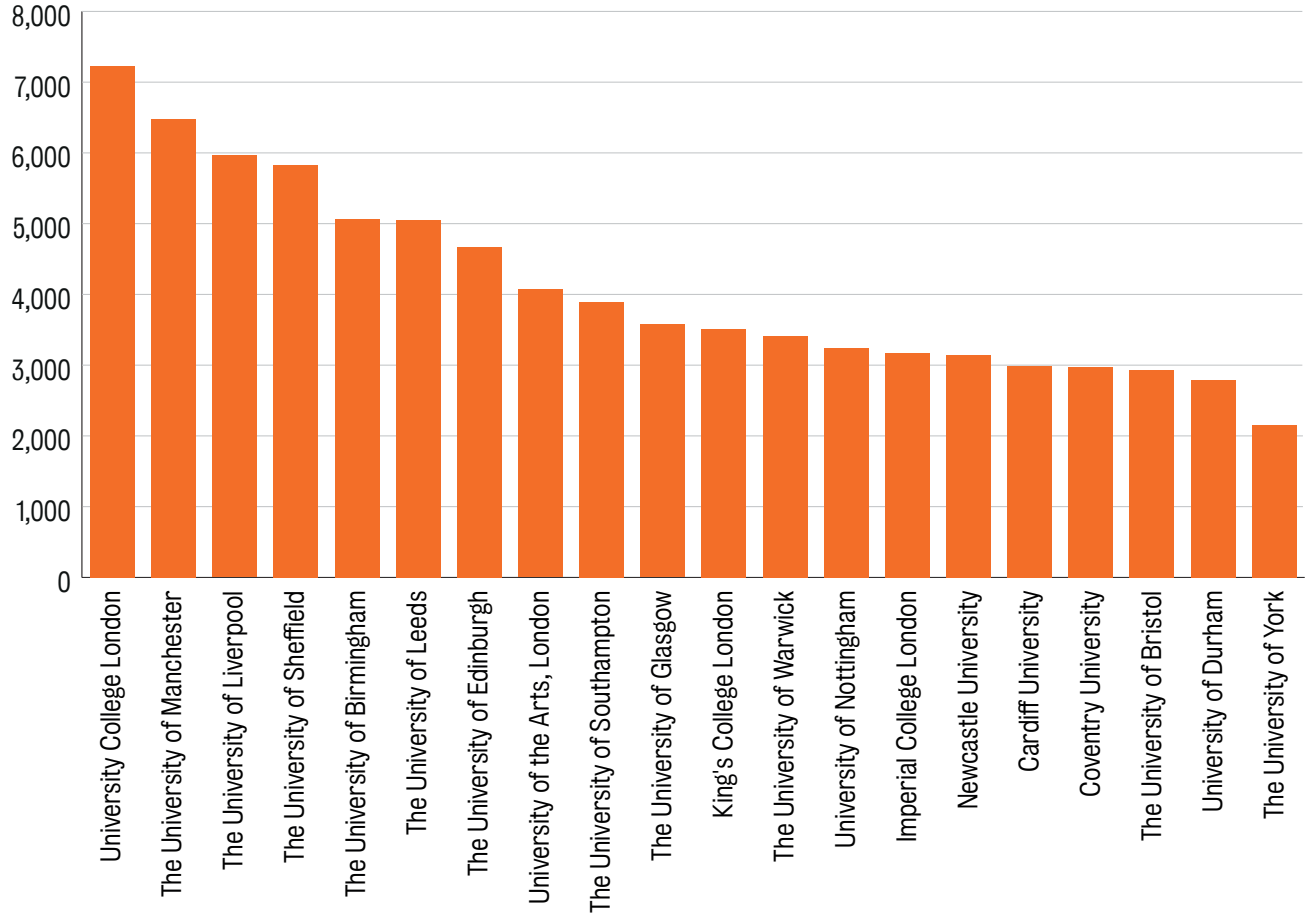


Figure 9: Top 20 UK HEIs with the largest number of students from China



Level of study

Most of the Indian students in the UK are studying at the postgraduate taught level. There are significant shifts in students' level of study over the past decade. While the demand for taught master's programmes continues to expand, the proportion of postgraduate taught degrees declined from 84 per cent in 2009/10 to 75 per cent in 2019/20. Demand for undergraduate study grew its share from 14 per cent in 2009/10 to 24 per cent in 2019/20.

The British Council in India observes the increases in undergraduate students is partly linked to the expansion of international boards of education in the country's school market. According to the heads of these schools between 40 to 65 per cent of students studying in these schools choose to study overseas. Universities active in India are growing their engagement with feeder schools through summer schools, taster lessons and bespoke partnerships with these schools.

Figure 10: Changes in level of study

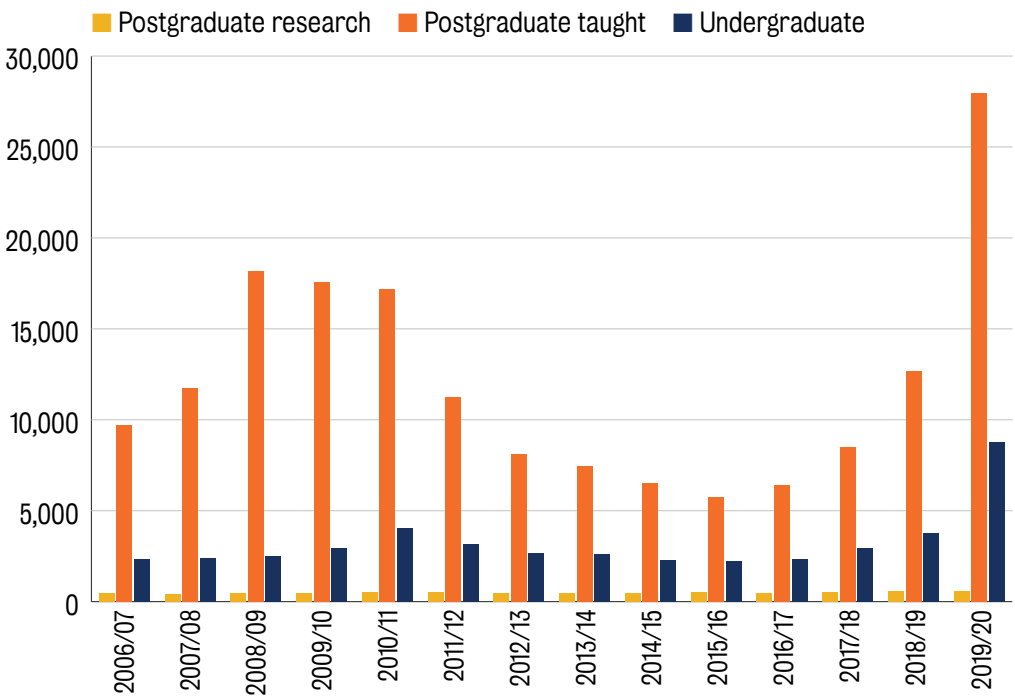
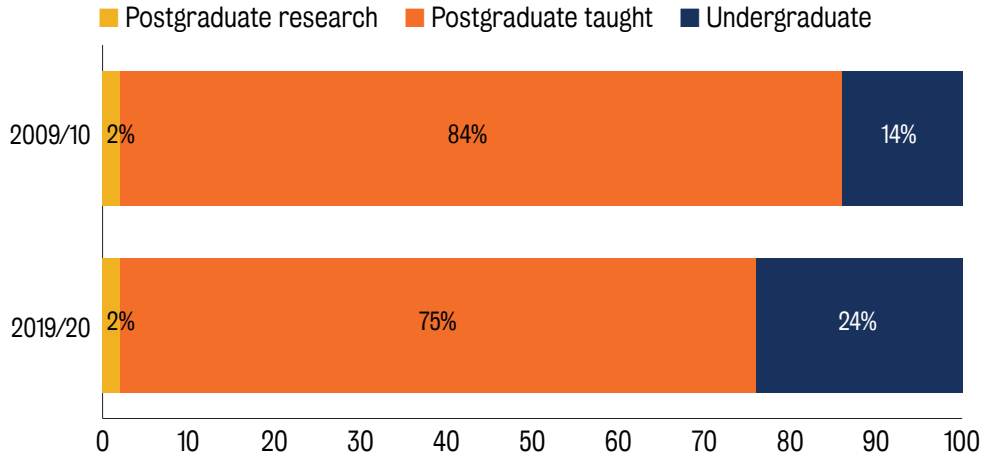


Figure 11: Changes in the proportion of level of study



Students from India accounted for 20 per cent of the overall full-time non-EU master's students in 2019/20, 8 per cent of the first-degree students and 5 per cent of the PhD students.

Master's students from India increased by 226 per cent between 2017/18 and 2019/20 (from 10,140 to 33,115 students). They accounted for 9 per cent of the non-EU master's in 2017/18.

Subject of study

Students' preferences for the subject of study have changed over the past 10 years. This analysis requires caution, given changes in subject classifications in the UK. A new subject coding system – the Higher Education Classification of Subjects

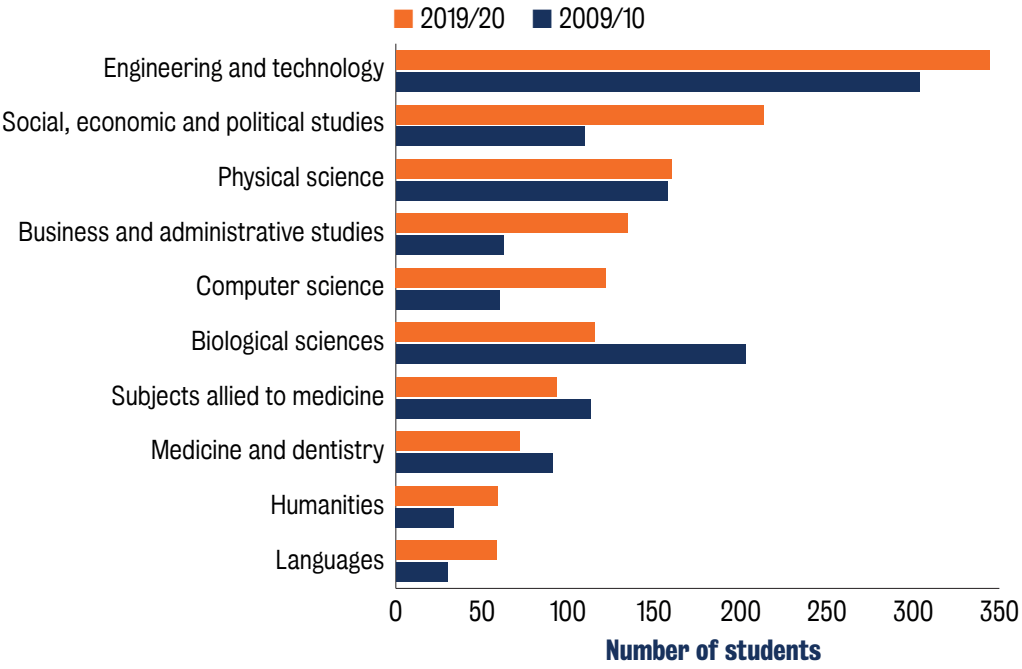
(HECoS) – was implemented in 2019/20 to replace the Joint Academic Coding System (JACS),[53] different versions of which have been in use since 2002/03. The current system was developed independently, and direct mapping between HECoS and JACS is not possible. To track changes in the students' subjects preferences, we attempted mapping between the different subjects' coding systems in the UK between 2009/10 and 2019/20.

Popular subjects for postgraduate research students

STEM-related subjects are sought after by Indian students. Engineering and technology have remained the most popular subject of study at the research level over the past decade. Biological sciences were the most popular subject in 2009/10, but have since has dropped to sixth place. Economic, social and political studies were fifth-most in-demand in 2009/10 but rose to second-most in 2019/20.

A significant proportion of the students who started doctoral studies in 2019/20 were sponsored by a UK institution: 39 per cent of the students received such funding, and a further 2 per cent had their tuition fees waived. Just over a third of the doctoral entrants (35 per cent) were self-funded.

Figure 12: Top 10 broad subject areas for postgraduate research students



Source: HESA Student Record, 2009/10-2019/20.

The uncertainty of large-scale research programmes like Newton Bhabha is likely to have a negative impact on the UK-India research partnerships and the number of early-career researchers. One of the prominent strands of Newton Bhabha was the mobility of PhD students and the support for early-career researchers.[54] While there is a challenge to develop an alternative substitute at that scale, some institutions are launching double PhD programmes to further enhance their collaborations with

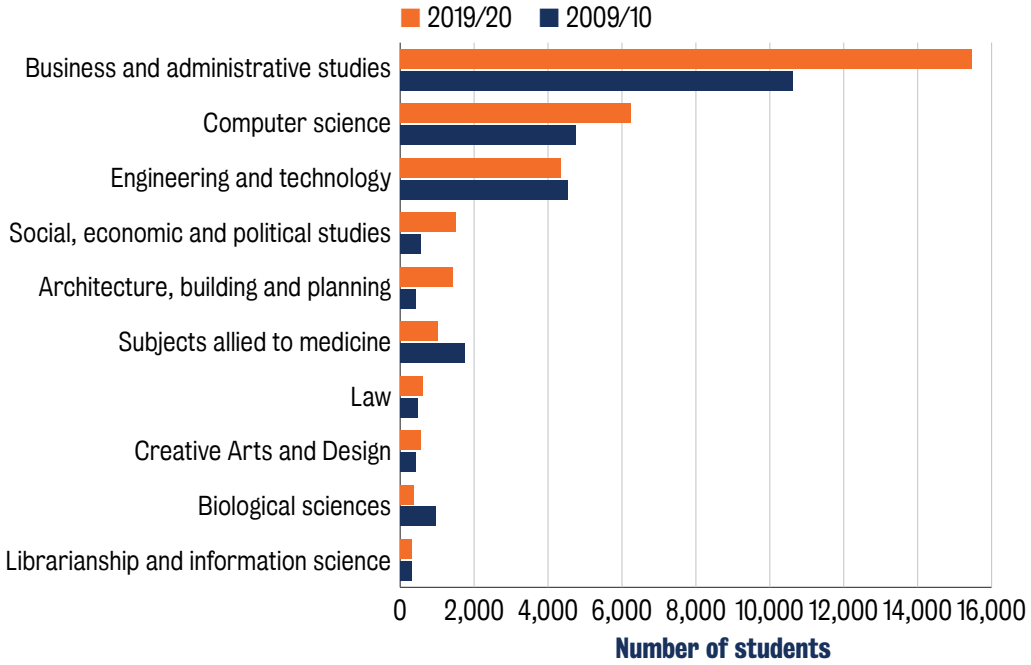
Indian partners, such as the collaboration between the University of Manchester and IIT Kharagpur.[55]

Popular subjects for postgraduate taught students

There were few changes at the postgraduate level of study, where business and administrative studies continue to be the dominant subject area. Almost half of all postgraduate taught students (47 per cent) are studying business-related subjects.

Computer science and engineering and technology remained in second and third place respectively over the past decade. Significant reductions were noted in subjects allied to medicine and biological sciences, where student numbers dropped in the current recruitment cycle compared to 10 years ago.

Figure 13: Top 10 subjects for postgraduate taught students



Source: HESA Student Record, 2009/10-2019/20.

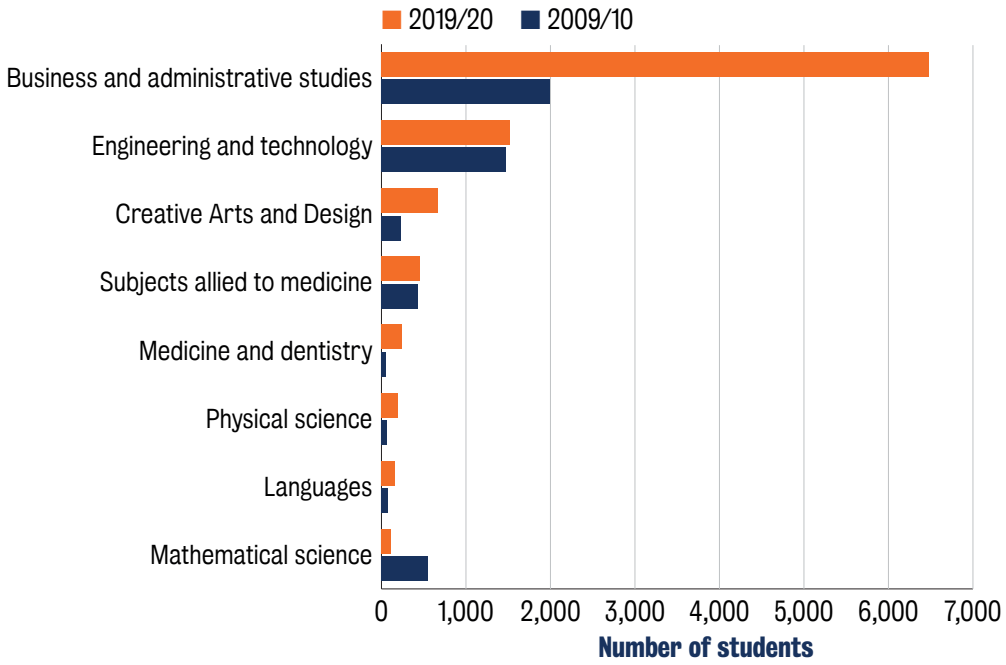
Other countries, like the US, target international students in certain subject areas through the post-study work route known as Optional Practical Training (OPT).[56] STEM graduates in the US are entitled to a 24-month extension of their 12 months of employment through OPT. This explains the high concentration of Indian students in STEM subjects.

Popular subjects for undergraduate students

Business and administrative studies are popular at the undergraduate level of study. Computer science significantly increased over the past decade and ranked second in popularity in 2019/20, followed by engineering and technology.

Mathematical sciences were the third most popular choice for students in 2009/10 – however, they ranked in 15th place in 2019/20.

Figure 14: Most popular subjects with undergraduate students

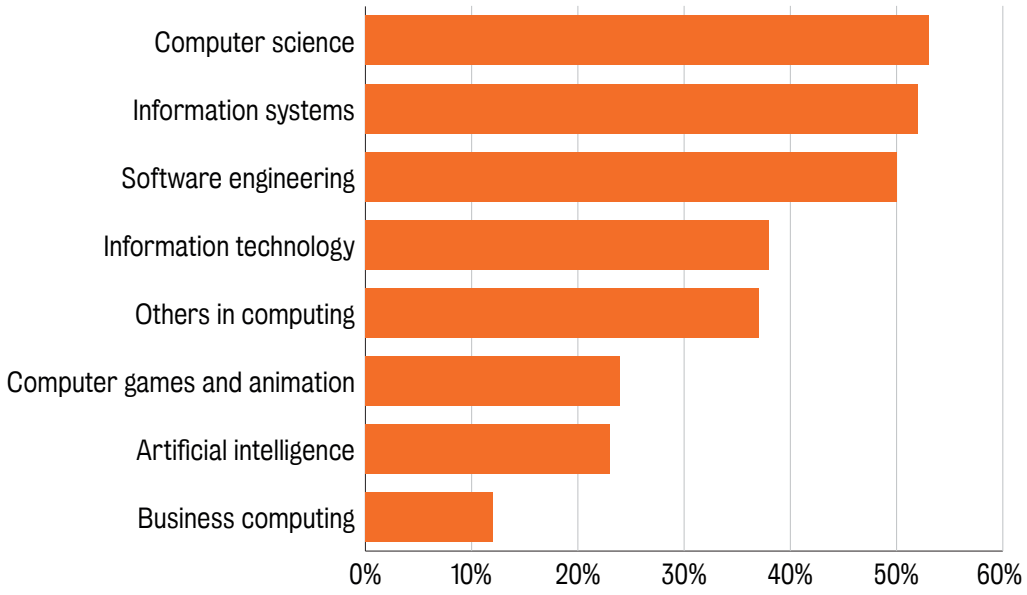


The importance of Indian students for engineering and computer science subjects

Indian students are attracted to business and administrative studies in high numbers, but their concentration is highest in subjects related to computing and engineering. Students from India make a critical contribution to engineering and technology-related issues, where they account for 29 per cent of the full-time non-EU master's students. Their concentration is the highest in mechanical engineering and production and manufacturing engineering, where they represent 44 per cent and 45 per cent, respectively, of the overall non-EU master's students.

Computer science-related subjects are the area with the highest numbers of Indian students after business and administrative studies. At the master's level, Indian students account for more than half of the non-EU students in computer science (53 per cent), information systems (52 per cent) and software engineering (50 per cent).

Figure 15: Computer science master's students from India as a proportion of non-EU students, 2019/20



Source: HESA Student Record, 2009/10-2019/20.

Models of student recruitment in India

A decade ago, most of the students from India – 84 per cent – studied master's programmes. A master's degree, combined with two years' work experience, offered good value for money. Compared with other global study destinations, the UK programmes have the shortest study duration of under one year. Typically, master's programmes in the US and Australia are a year and a half to two years long.

The changes to the post-study work route in 2012 led to waning demand for UK education. Students perceived the short notice to its discontinuation as damaging for the UK's reputation. India was an established student market where UK education enjoyed excellent brand recognition and long history of student recruitment.

The reintroduction of post-study work in Australia in 2012, OPT in the US, and an attractive post-study offer in Canada caused a loss of interest in the UK as a study destination, both with students and education agents in India. High student visa refusal rates and education establishments with a revoked license to recruit international students contributed to growing uncertainty in recruitment to the UK and low conversion of student applications to enrolments. Given education agents operate on a commission, their business model generated better returns from recruitment to countries with more attractive value propositions to students.

The change in education agent behaviour caused a varied response from the universities. Some felt the need for a different operating model in India, which needed to counteract education agents' lack of interest. In contrast, others thought they were better off directing their recruitment efforts to countries with lower visa refusal rates. The reduction in the highly trusted sponsors' refusal rate to under 10 per cent in 2014 meant that some universities significantly reduced recruitment in some

parts of India and other countries with high refusal rates, like Nigeria, Pakistan and Bangladesh. As a result, the latter group closed their physical operations in India.

This deterioration in the recruitment climate pushed universities to rethink their value offer to Indian students, with employability a critical consideration. Some added practical placements as part of studying in the UK as an alternative to the discontinued post-study work route. Alternative business models of student recruitment in India started to evolve.

Contribution of Indian students to the UK HE system and UK economy

International education is one of the largest export industries across the main study destination countries. In Australia, education is the country's fourth largest export. The Australian Bureau of Statistics details the country's education exports and publishes the data by market.[57] This provides credible and timely feedback on how the markets are responding to policy changes and the impact of external events like Covid-19.

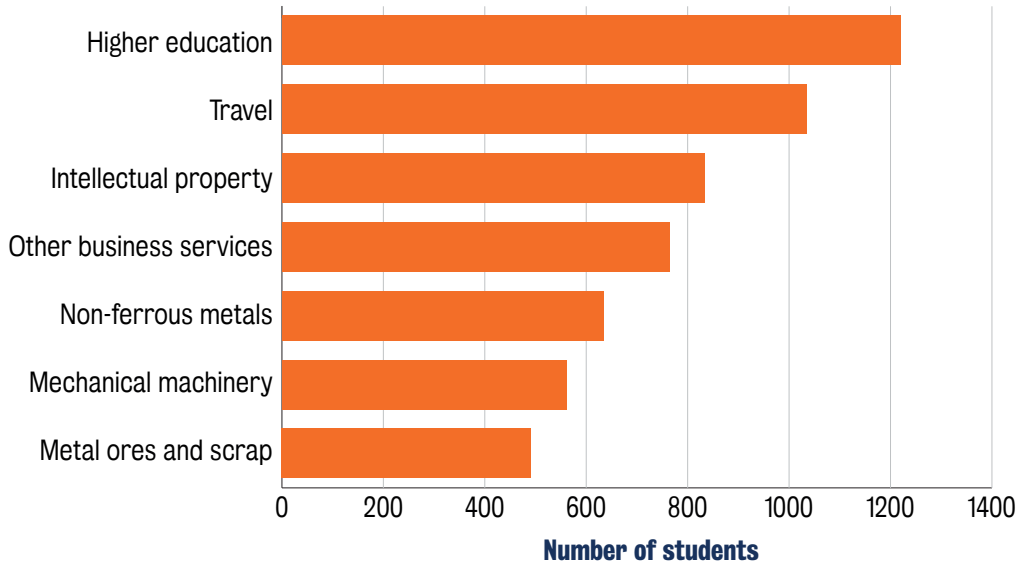
In the UK, the Department for Education and national agencies provide estimates about education export contributions to the UK economy. A report from the DfE shows that UK revenues from education-related exports were estimated to be £23.3 billion in 2019.

Inclusion of education exports by the UK's Office for National Statistics will help develop robust national export statistics and improve the accuracy of the existing estimates. International students make significant financial contributions to the UK economy. However, these are not visible to policymakers and the general public. Our earlier report, *The China question*, cited DfE estimates for education-related exports as the UK largest service export in 2018, significantly higher than the contribution of financial services.

We estimate that the value of UK HE exports from newly enrolled full-time Indian students in 2019 was approximately £1.2 billion. This calculation uses the London Economics model for Universities UK International and the Higher Education Policy Institute and it is adjusted for inflation.[58]

Figure 16 shows the key exports from the UK to India in 2019, published by the Department for International Trade.[59] If higher education exports were included in the official statistics, their contribution would have been the UK's single largest export to India.

Figure 16: Key exports from the UK to India in 2019



Source: Department for International Trade (2021) and authors' estimate.[60]

The UK's exports to India were estimated at £7.8 billion in 2019, with higher education exports accounting for 16 per cent of the total. But these findings need to be treated with caution because of the different methodologies used by the ONS and others to calculate the export values of the industries. This signals a gap in the national statistics, which can only be addressed if education exports are recorded in their own right.

Potential for growth in transnational education

With over 35 million students, India has the world's second-largest tertiary education system after China.[61] While this represents 15 per cent of the tertiary students globally, the country's participation rate is 28 per cent, significantly below the world average of 39 per cent.

Transnational education (TNE) is broadly defined as education delivered in a country other than the home country of the awarding institution.[62] Over the years, TNE has evolved to absorb unmet domestic demand for higher education. Forms of independent and collaborative models of TNE provision offer an alternative to students beyond the binary options of studying at a home institution or travelling overseas for their higher education degree.

International branch campuses in India

In India, the regulation of foreign education provision has attracted heated debates and controversies over the past two decades. The first attempt to pass a foreign providers' bill was in 2007, later rejected because of concerns about the commercialisation of higher education and opening the domestic system to foreign competition. A revised version of the bill – the Foreign Educational Institutions

Regulation of Entry and Operations (Maintenance of Quality and Prevention of Commercialization) Bill 2010, also known as the Foreign Educational Bill – was first introduced in the Lok Sabha in 2010. While the government favoured the bill, opposition from other parties and the private HEIs delayed the outcome. Three years later, the bill lapsed. A study carried out by the Association of Indian Universities in 2010 showed that from the 631 foreign HEIs active in India, only five had branch campuses. The C-bert database of international branch campuses identifies only two overseas education institutions with a physical presence in India.[63]

Foreign education institutions are regulated by private university legislation. However, there is high complexity in navigating the regulatory environment, and the rules vary from one state to another. The individual states can accredit foreign education institutions; however, their respective degrees are not recognised in the rest of the country without an act of parliament.[64]

A survey funded by the National Institute of Educational Planning and Administration conducted between December 2020 and February 2021 collected responses from 43 foreign institutions. From those, eight expressed an interest in setting up a branch campus operation in India. These institutions included five universities from the US and one each from Australia, Canada, and the UK. All surveyed institutions stated that a liberal regulatory framework for international branch campuses is necessary to materialise their ambition.[65]

The country's National Education Plan recommends a regulatory framework for international branch campuses set up by institutions featured in the world's top 100 institutions. Decisions around the establishment of overseas physical operations require thorough due diligence and a long-term commitment. It may take years to arrive at a university-wide consensus over an international branch campus. Given league tables are generated annually, it is possible that institutions in the process of setting up a branch campus operation lose their "Top 100" status following their initial application to set up in India. This will result in a significantly more onerous application process.

The C-bert database of international branch campuses shows that five Indian institutions operate 12 branch campuses globally. Each of those institutions has a physical presence in the United Arab Emirates. Mauritius, Uzbekistan, other countries with Indian branch campuses, Singapore, Nepal, Sri Lanka, and Australia.

Transnational education programmes in India

TNE programmes in India are allowed; however, their accreditation attracts a high level of scrutiny. There is little flexibility in adapting the programmes of overseas institutions to fit the local context and student demand better.

Regulatory bodies responsible for TNE between overseas and Indian institutions are the University Grants Commission (UGC) and the All-India Council for Technical Education (AICTE). The UGC approves those TNE programmes not falling within AICTE or professional councils' remit.

Chapter 3 of the AICTE's Approval Process Handbook 2021-22 details some significant changes in the type of permitted TNE collaborations. It specifies that "Collaboration and Twinning shall be allowed with Foreign University having ranking within top 500 as per the QS World Ranking and Indian University shall be within top 100 NIRF[66] Ranking in the preceding year."[67]

The handbook also details the collaborative arrangements between the partners. It specified: "There shall not be any distinction in the academic Curriculum, mode of delivery, the pattern of examination, etc. Such Diploma/ Post Diploma Certificate/ Under Graduate Degree/ Post Graduate Diploma/ Post Graduate Degree should be fully recognized in their Parent Country."[68]

An additional requirement, which affects the flexibility of these programmes, is linked with regulatory requirements for the time students are required to spend with the overseas partner institutions:

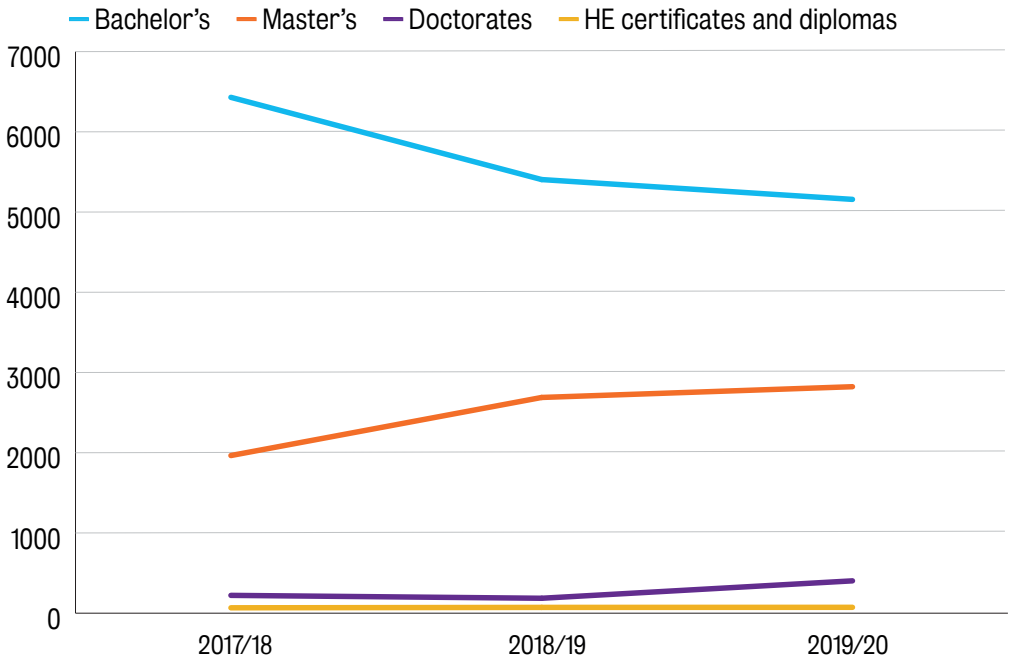
- at least one semester of the two-year programme; and
- two semesters of a four-year programme.[69]

Our desk research shows 13 programme-level collaborations between Indian institutes and overseas universities. In addition, TNE programmes are set up between five large-scale Indian higher education institutions and foreign universities.

UK transnational education programmes in India

Approximately 8,500 TNE students were studying towards UK qualifications in 2019/20. The Aggregate Offshore Record collects data on students studying towards UK degrees who are based wholly overseas.[70] The number of TNE students based in India in 2019/20 remained unchanged compared to the previous year. However, the number of bachelor's students continued to decline, whereas demand for master's courses increased.

Figure 17: TNE students by level of study



Source: HESA Aggregate Offshore record. Our analysis excludes Oxford Brookes University to isolate the effects of one institution on the student record.

Bachelor's students accounted for three-quarters (74 per cent) of the overall TNE students in India in 2017/18, but this dropped to 61 per cent in 2019/20. The ratio of master's students increased from 23 per cent in 2017/18 to 33 per cent in 2019/20.

Previous research shows the collaborative type of TNE can widen access to higher education, support the capacity-building of local HEIs, attract highly skilled talent to the place of its delivery and reverse brain drain.[71] There is an opportunity for the new regulatory framework for TNE in India to improve flexibility, focus on the quality of education provision and incentivise institutions with a track record of collaborative cross-border education to engage with local institutions.

India is a priority country under the UK's International Education Strategy.[72] The regulatory environment in the country is evolving and is likely to become more liberal. UK government support for TNE partnerships in India will ensure a more diversified picture emerges and help bolster their sustainability.[73]

Conclusion

This section shows that political and economic factors have impacted international student demand from India over the past two decades. Pressures from all sides culminated between 2012 and 2014 when:

- The discontinuation of post-study work visas was announced in 2011.
- The post-study work route was phased out in 2012, leading to a collapse in the number of enrolments of Indian students in the UK.
- Australia reintroduced post-study work in the same year, which led to a surge in the number of enrolments from India, which most likely happened at expense of student mobility to the UK.
- The Home Office set the highly trusted sponsors' refusal rate set at 20 per cent in 2012, which was then further reduced to 10 percent in 2014. This led to UK institutions effectively pulling out from India and focusing their recruitment efforts elsewhere.
- Demand-side economic influences, such as the fluctuations in the exchange rates and the price of gold in India, further contributed to the declines in Indian demand for UK education.

Indian students seeking higher education in the UK are price-sensitive and responsive to post-study work visas, scholarships and tuition fee waivers. A key driver of student demand is the availability of post-study work opportunities. Our analysis shows that the availability of such options determines the direction of travel for globally mobile Indian students. These policies also impact education agents who are providing student advice on study destinations.

The introduction of visa refusal thresholds for Tier 4 sponsors disincentivised HEIs from recruitment in India and directed them towards jurisdictions with low refusal rates, like China and those in East Asia.

Student demand to the UK rebounded in 2018/19, following the announcement of the reintroduction of the post-study work route. While master's programmes continue to attract large numbers of students, growth is higher at the undergraduate level. The proportion of undergraduate students increased from 14 per cent to 24 per cent over the past decade. Most Indian students seek engineering and computer science courses.

Scholarships and tuition fee waivers are another critical factor. A significant proportion of the students who started doctoral studies in 2019/20 were sponsored by the UK institution: 39 per cent of the students received such funding, and a further 2 per cent had their tuition fees waived. This makes India one of the countries with the largest proportion of doctoral students who were supported by their UK institution. National-level scholarships for Indian PhD students are likely to increase the

popularity of the UK as a study destination for Indian researchers. In 2019/20, just over a third of the doctoral entrants (35 per cent) were self-funded.

Higher education was the UK's largest export to India and accounted for 16 per cent of the UK's overall exports to India in 2019.

TNE presents an excellent opportunity for the UK to widen its global footprint in India and support its ambitions to widen access to higher education. However, the regulatory environment remains comparatively restrictive, with little flexibility for those engaged in TNE in India.

2. Strengths and weaknesses of the existing research relationship

India has a significant and growing research capacity and India's researchers have made significant contributions to research and innovation in universities and industries across the world. Despite this acknowledged competency, India has struggled over recent decades to realise the same potential in the home economy. For research comparator purposes, India is considered as part of a BRICK group, which for our data analysis is deemed to include Brazil, Russia, India, China and South Korea. The continuing development of economies in this group can usefully be set alongside the established G7 economies. Collectively, the G7 and BRICK groups account for over 80 per cent of annual research publications in academic journals globally.[74]

India's research base

World Bank data shows that India has spent a consistent 0.6 to 0.7 per cent of a GDP of $8 trillion as gross expenditure on research and development (GERD) over the last 25 years. This is a significant sum, representing about 2.7 per cent of global GERD. The UK, by comparison, is on a slightly rising trajectory towards 1.8 per cent of a GDP of $3 trillion. Thus, the absolute volume of the two countries' R&D spend is similar. Elsewhere in Asia, China's GERD has risen from 0.5 per cent to 2.3 per cent of a $17 trillion GDP, and South Korea has increased spend from 2 per cent to nearly 5 per cent of a $1.6 trillion GDP.

It is estimated that about 12 per cent of India's workforce has a graduate level or higher qualification. World Bank data on the numbers of workers identified as researchers shows that India has about as many people identified in this category as the UK, although this is drawn from a much larger population. India is home to about 17 per cent of the global population, which is slightly less than that of China but much greater than the UK (which represents less than 1 per cent). The "researcher density" – the numbers of researchers relative to population – is thus much lower than in the UK and China. It was the eighth most prolific research publishing nation over the last five years and, while the UK has the highest productivity per researcher, India's researcher population, in terms of these indexed academic publications, is as productive as that in Germany.

TABLE 3: POPULATION, RESEARCHER COUNT AND RESEARCH PUBLICATION PRODUCTIVITY

	2018 W Bank			Avge 2014-18 WoS	Average annual	
	Population (m)	Researchers in R&D/m	Researchers	Papers	P/10k-pop	P/ 10-res
China	1398	1307	1827186	421,552	3.02	2.31
Germany	83	5212	432596	168,961	20.36	3.91
India	1366	253	345598	105,592	0.77	3.06
Japan	126	5331	671706	121,895	9.67	1.81
S Korea	52	7980	414960	77,183	14.84	1.86
UK	67	4603	308401	209,508	31.27	6.79
USA	328	4412	1447136	711,717	21.70	4.92

Research publication output is a proxy for underpinning research activity. It is a useful proxy because data are available globally on a comparable basis, whereas expenditure is affected by many economic and accounting factors, researcher headcount is subject to interpretation, and any count of "projects" or "grants" is essentially unverifiable or non-comparable between national systems

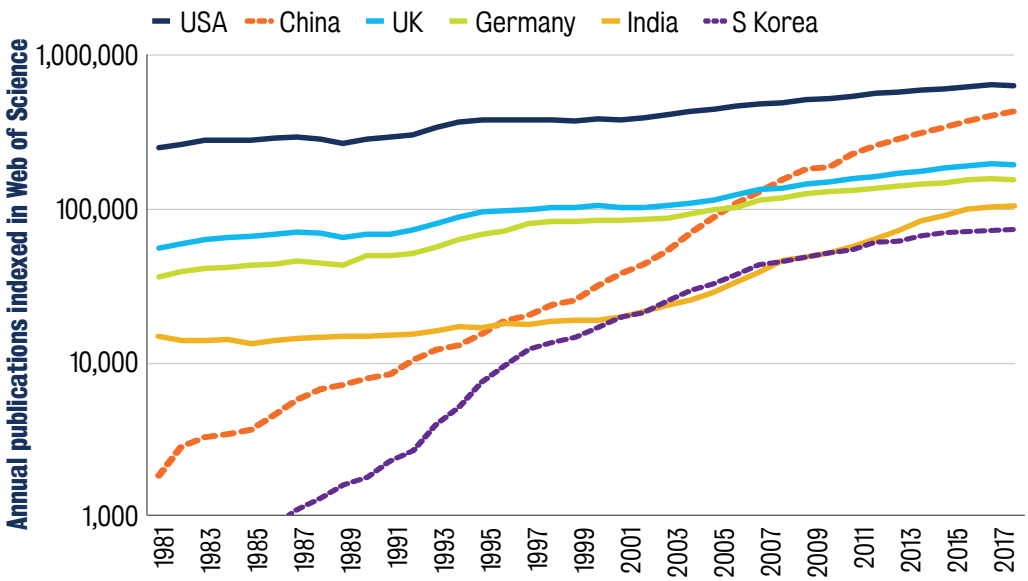
The Web of Science provides an accessible and comprehensive dataset which is processed to a high editorial standard and consistent across 40 years. It annually indexes about 20,000 research journals, selected in terms of editorial standards and global research influence, and balanced across regions and disciplines. These add up to about 2 million additional articles, reviews and conference proceedings per year, with an accumulated total of 18 billion cross-references (citations) between the indexed article records. This provides a sound and consistent basis for international research comparisons.

An outcome of India's relative level of investment is that it has seen a gradual rise in the numbers of papers (substantive academic articles and reviews) published and indexed on the Web of Science journal set, and that this rise was somewhat steeper after 2000.

Publication volume remains ahead of South Korea but has been overtaken by China and remains behind larger EU economies. The current trajectory suggests, however, that India is no longer expanding its publication output at the same pace as it did in the last 15 years or so. At present, India's research output is somewhat less than Japan's, slightly more than South Korea's and about one-quarter that of China's, which continues to expand at an exceptional rate compared to G7 countries.

Figure 18: Annual output of papers (scholarly articles and reviews) indexed on Web of Science

Source: All data from Web of Science, provided by clarivate



Note that the vertical axis is a log plot. A straight-line trajectory for output growth thus indicates a sustained rate of increase.

Research collaborations

India's growth in publications has increased its share of the global total, which has risen from around 2 per cent of all papers indexed on Web of Science in the 1980s to about 4 per cent in recent years (which can be compared to its 2.7 per cent share of global GERD). Much of India's growing research output is co-authored with other nations, which is part of a significant and global expansion in international research collaboration over the last 40 years.[75] As much as two-thirds of research output is now internationally collaborative for the established G7 research economies: a rising share of their publication activity that is driven by leading research institutions and is increasingly multilateral.

For India, about one-quarter of its recent research papers have had one or more international co-authors, split evenly between bilateral and multilateral partnerships, and this share is growing. The collaborators are drawn from a wide network that is clearly headed by the US (as it is for most countries) and includes significant participation from South Korea, the UK, and increasingly from China. All these countries co-authored more than 1,000 papers with India in 2020.

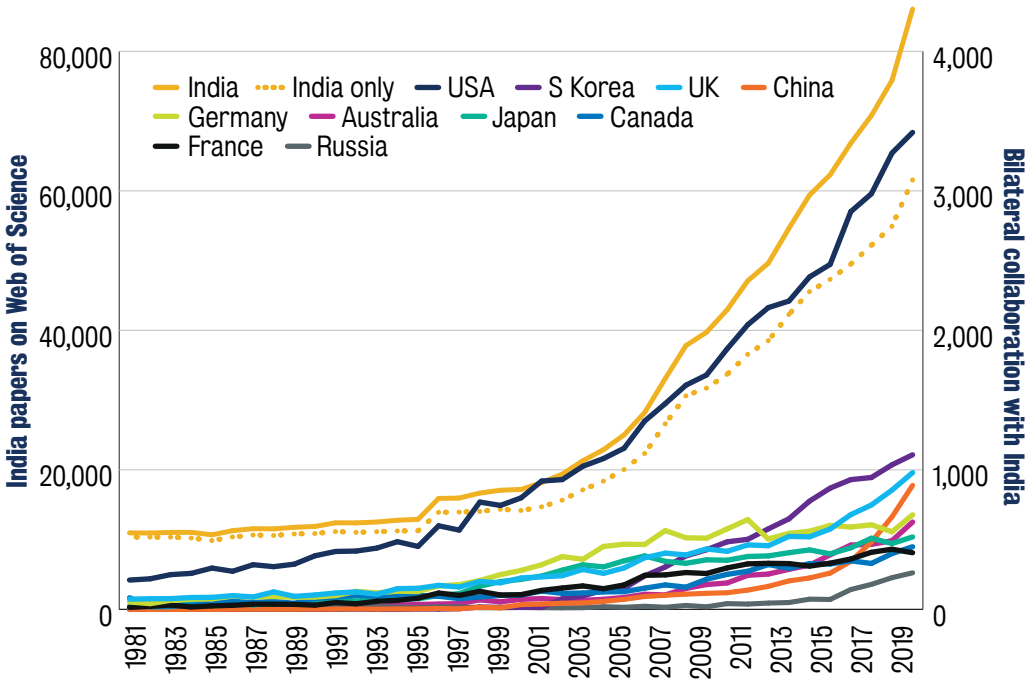
For comparison, about two-thirds of output for France, Germany or the UK is internationally collaborative, and, like India's, it is balanced between bilateral and multilateral – although the latter is expanding more rapidly. China's international collaboration represents a similar proportion of output to India's, but bilateral papers are predominant (about 75 per cent).

The global acceleration in multinational partnerships makes the overall data more complex to interpret. Focusing on the headline figures, it is informative to reduce the data to bilateral partnerships, ie those involving India and only one other co-

authoring country. This removes the complex networks of subjects such as particle physics, astronomy and epidemiology, which depend on international teams, and reveals where strong one-to-one links continue.

UK collaboration with India is rising on both shared multilateral and specific bilateral co-authorships. Because the UK has a very extensive multilateral network, it is unsurprising that it is India's second most frequent partner overall after the US. But it is more important to note that the UK is also India's third most frequent bilateral co-authoring partner, moving ahead of Germany in 2015, while India was the UK's 25th most frequent bilateral co-authoring partner in 2012 and is now the 16th most frequent. The rise of China as a research partner for India will also be of policy interest, having come from nowhere to fourth and just behind the UK. There are, of course, some tensions between the countries but research collaboration can be a valuable route for soft diplomacy. The data may suggest that China could become India's second most frequent research partner, and most India co-authorships with China are bilateral, so this could represent a marked expansion in India's research activity, but political factors could also shape this trajectory.

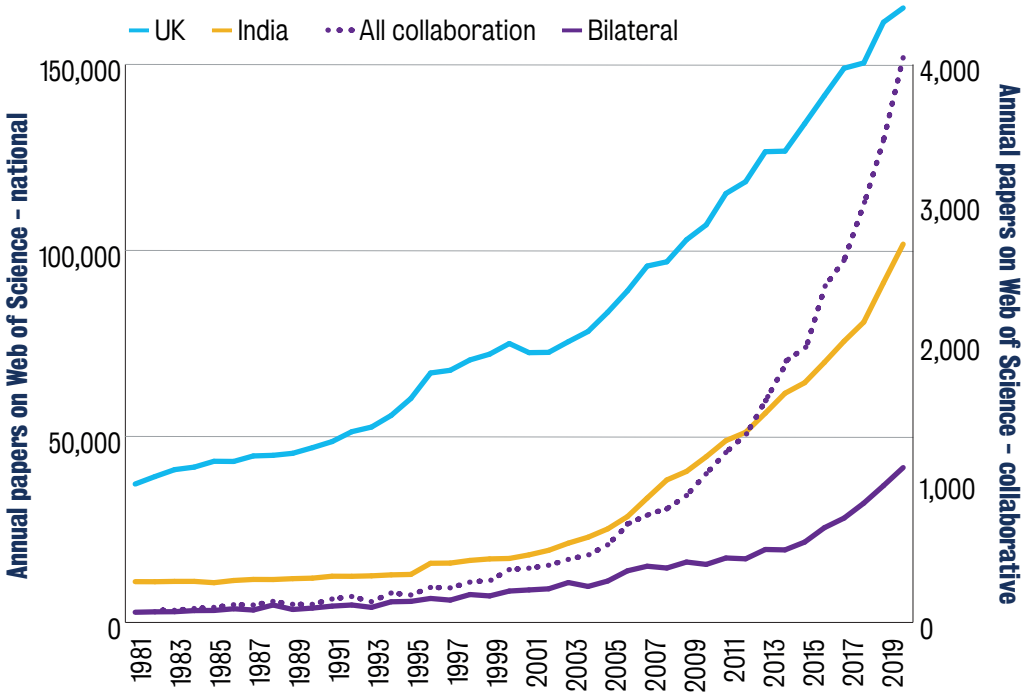
Figure 19: India's research output and bilateral international collaboration



The annual count of papers (articles and reviews) with an author address in India that were published in journals indexed on the Web of Science is shown on the left axis. The numbers of these that have a collaborative author from one other country is shown on the right axis. The sequence of countries in the key is in descending order of their bilateral collaboration with India.

If we draw the UK data in Figure 19 together with other data on India and the UK, then we see that co-authorship of multilateral papers with the UK, where the UK is India's second most frequent partner, has become more common than bilateral partnerships since the late 1990s and is on a rising trajectory, so engagement between the two countries is not diminishing but evolving (Figure 20).

Figure 20: National and collaborative output for the UK and India



Data are shown as total national output in year for each country (left axis) and the numbers of bilateral papers (only UK and India co-authors) and multilateral papers (with co-authors from at least one other country) (right axis).

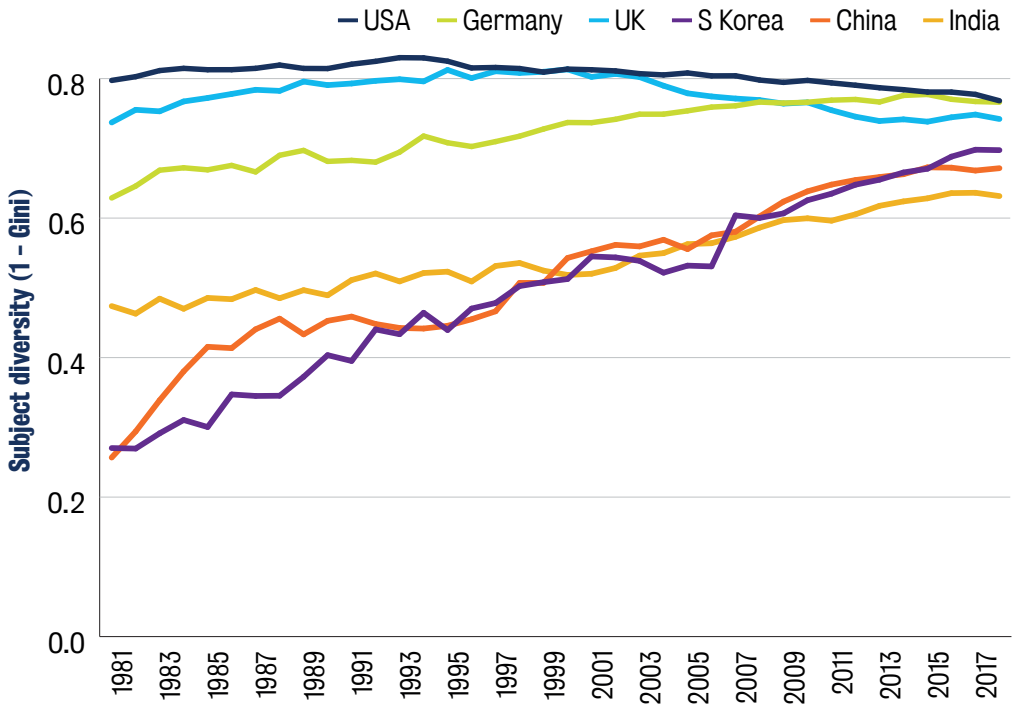
The balance between bilateral and multilateral collaboration is changing for India, as it is globally. Both types of partnership increased, as a share of annual output, until around 2000, when the proportion of papers that were internationally bilateral plateaued, as it did at around the same time for partnerships in other countries. Since then, India's multilateral collaboration has continued to rise both in volume and as a share of the annual total.

India's multilaterally co-authored papers now account for about the same proportion as do their bilateral papers, which is a similar pattern to the UK. This is a higher proportion of total output than it is for South Korea and much higher than for China – but lower than, for example, Malaysia and Vietnam. The frequency of co-authorship with Singapore and Taiwan is also rising and has roughly doubled over the last five to six years. Taiwan now has as many bilateral co-authored papers with India as does France. The possibility that India may therefore grow into a significant hub for internationally collaborative research in South and East Asia should therefore be a consideration.[76]

An outcome of increasing collaboration is that it offers the possibility of working with researchers with complementary strengths, increases the effective capacity of the national research base and thus allows it to diversify. It is a general characteristic that research subject diversity across individual countries has increased over the last few decades and, unsurprisingly, it has risen most where research growth has been greatest.[77] Diversification of the research base is an important strategic consideration because research diversity supports broader national resilience against challenges (such as pandemics and climate change) and enables rapid response to new opportunities that emerge from innovative research. It can thus contribute significantly to technological and economic competitiveness.

India's research subject diversity (indexed as evenness of publication output across Web of Science journal categories compared to a world average baseline) has risen rather more slowly than comparator countries. It has been overtaken in this regard by both China and South Korea, which themselves are now similar in research diversity to the G7 group (Figure 21).

Figure 21: National research subject diversity (indexed as evenness of output compared to world average)



Analysis uses the Gini index, which measures statistical inequalities, and the data are displayed as (1-Gini) to display evenness as statistical diversity.

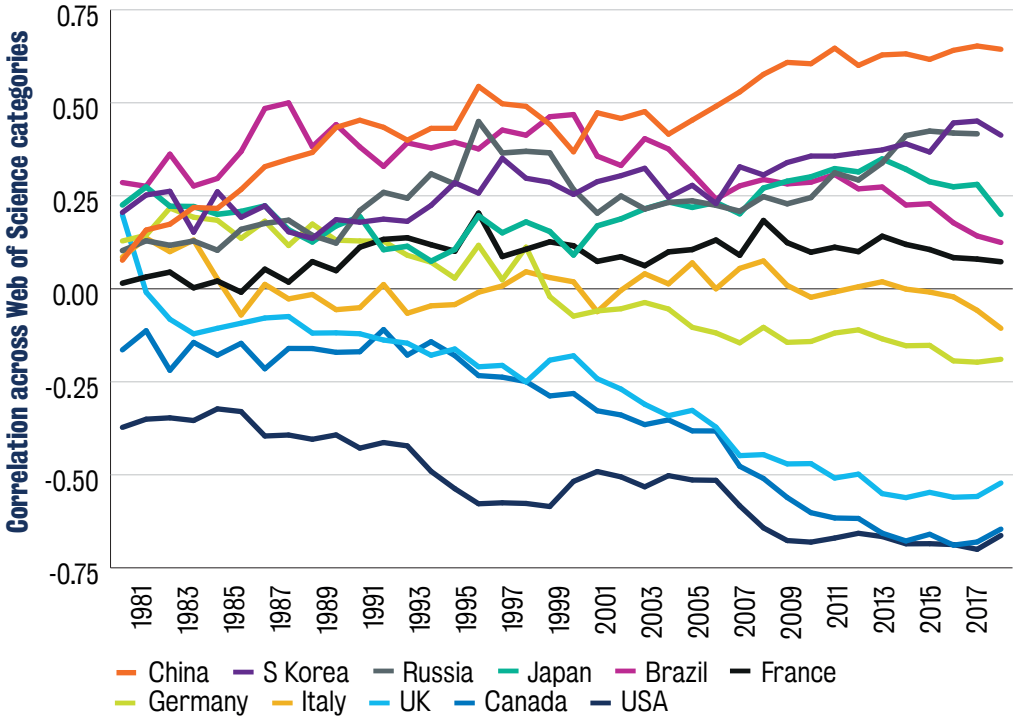
Countries with similar indexed diversity do not necessarily have similarity in portfolio content. It is possible to arrive at the same index value for different subject combinations. Similarity of country research portfolios is calculated by comparing the proportion of each country's output that falls in each of the 254 Web of Science journal categories. A positive correlation between these indicates that they have a similar balance in their portfolios and specialise in the same areas. A negative correlation indicates that they have a very different balance.

Analysis of pair-wise similarity between India and both G7 and other BRICK countries (as defined earlier) shows that India has diverged from a relatively neutral position in the 1980s (ie its research then was neither very similar nor dissimilar to most others). Its research portfolio has become increasingly dissimilar to the US, UK and Canada, although it remains relatively neutral with respect to leading EU countries. This may seem surprising given the relatively high proportion of overseas trained Indian postgraduates who have worked in those countries, but reflects the balance of investment in biomedical sciences, which is much higher in Europe and North America.

By contrast with its divergence from the G7, India has become rather more similar to Russia and South Korea. More recently its similarity to China has risen substantially, which is of interest given signals of their growing collaboration, but is primarily driven by the extent to which both research economies focus on technology. With Brazil, it appeared in the 1980s to be converging but since 2000 has increasingly diverged (Figure 22).

It is, of course, essential from the perspective of India-UK research collaboration to understand where research portfolio similarity and dissimilarity arises. For an overview, it is informative to address this at a broad disciplinary level to get a general picture and then drill more deeply at a fine-grained level into areas of particular interest. We use the 21 "faculty"-level categories in Essential Science Indicators (ESI), provided by Clarivate, for this purpose, since these categories are generally familiar across countries and follow a sequence through medicine, life sciences, physical sciences, technology and social sciences. Arts and humanities are not included.

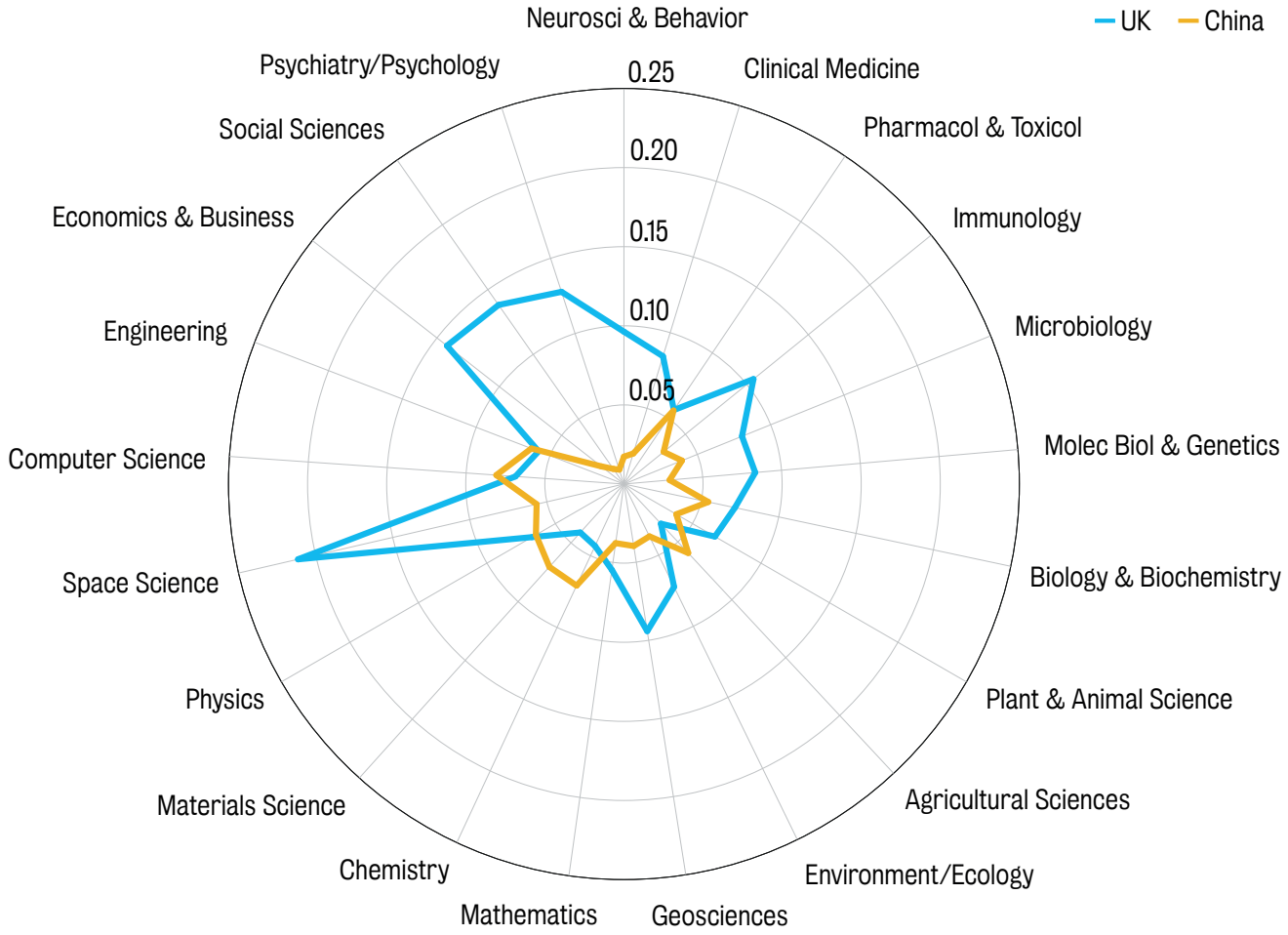
Figure 22: Similarity of India's research output to that of other BRICK and G7 nations



This analysis correlates the relative frequency of output for India with each other country across the 254 Web of Science journal categories.

If we consider the publication count in terms of world share by category (because the categories vary considerably in size) and then present the data in a radar diagram following the natural sequence, the graph shows the country's research footprint on the global landscape. Research footprints can readily be compared between countries. This reveals that, although India has similar total output to the UK (Figure 18), it has a much lower share of world total in engineering, social, medical and life sciences (except pharmacology) and a greater share only in agriculture and the physical sciences. These are areas where China is also strong (Figure 23).

Figure 23: Research footprint for India and UK, showing recent share of world output in 212 major research areas, using Essential Science Indicator categories



India's overall global share in the last decade has been about 4 per cent (proportion = 0.04 of world) and rising.

This data can be disaggregated further to look at those clusters of activity where India has been most productive. Note again that there are two aspects to this: absolute volume and world share. The areas where a country produces an absolutely large number of research papers may also be areas that are globally productive, so that does not necessarily equate to a high relative output. What is of particular interest are

those areas where India has both a high relative share of world output (ie its areas of particular focus) and where those papers have a relatively high research impact.

The average numbers of collaborative papers per year in successive five-year windows provides an indication of relative growth and the changing balance of collaborative activity. There has been a substantial expansion of India-UK activity in biomedical areas (particularly clinical medicine), which have grown from around 20 per cent to 30 per cent of India-UK collaborative output, although other life sciences have not grown as much. There have also been increases in environmental sciences and social sciences. Physical sciences (particularly chemistry) have, by contrast, seen a significant diminution in the balance of activity, down from 49 per cent to 32 per cent (Table 4). This is a different pattern from the changing pattern of collaboration with China, which has been concentrated in technology and physical sciences with surprisingly little growth in areas of biomedicine where the UK is internationally strong and may be due to policy shifts in the UK over eligible areas of research.

TABLE 4: INDIA-UK COLLABORATIVE PAPERS PUBLISHED IN JOURNALS INDEXED IN THE WEB OF SCIENCE

	2001–05		2006–10		2011–15		2016–20	
	Count	% total	Count	% total	Count	% total	Count	% total
Neuroscience & Behavior	6	1.4	13	1.6	26	1.7	61	2.0
Clinical Medicine	51	11.1	120	14.4	250	16.3	562	18.7
Pharmacology & Toxicology	7	1.5	18	2.2	23	1.5	56	1.8
Immunology	12	2.6	22	2.6	47	3.1	78	2.7
Microbiology	8	1.8	12	1.4	19	1.3	39	1.3
Molecular Biology & Genetics	9	2.0	19	2.2	39	2.6	70	2.4
Biology & Biochemistry	15	3.4	24	2.8	45	3.0	98	3.3
Plant & Animal Science	25	5.4	28	3.4	47	3.1	100	3.4
Agricultural Sciences	15	3.3	18	2.2	20	1.3	37	1.3
Environment/Ecology	8	1.7	23	2.7	58	3.8	123	4.1
Geosciences	21	4.6	29	3.4	57	3.7	93	3.1
Mathematics	4	0.9	12	1.4	19	1.2	26	0.8
Chemistry	82	18.0	138	16.9	149	10.0	262	9.1
Materials Science	22	4.9	36	4.2	56	3.7	155	5.1
Physics	83	18.0	161	19.2	330	21.9	443	15.5
Space Science	21	4.6	35	4.3	67	4.3	140	4.8
Computer Science	8	1.7	12	1.4	27	1.7	85	2.7
Engineering	31	6.8	48	5.8	90	6.0	259	8.5
Economics & Business	2	0.3	10	1.3	24	1.6	49	1.6
Social Sciences, general	17	3.7	39	4.6	90	5.9	166	5.6
Psychiatry/Psychology	9	2.0	16	2.0	30	2.0	59	2.0

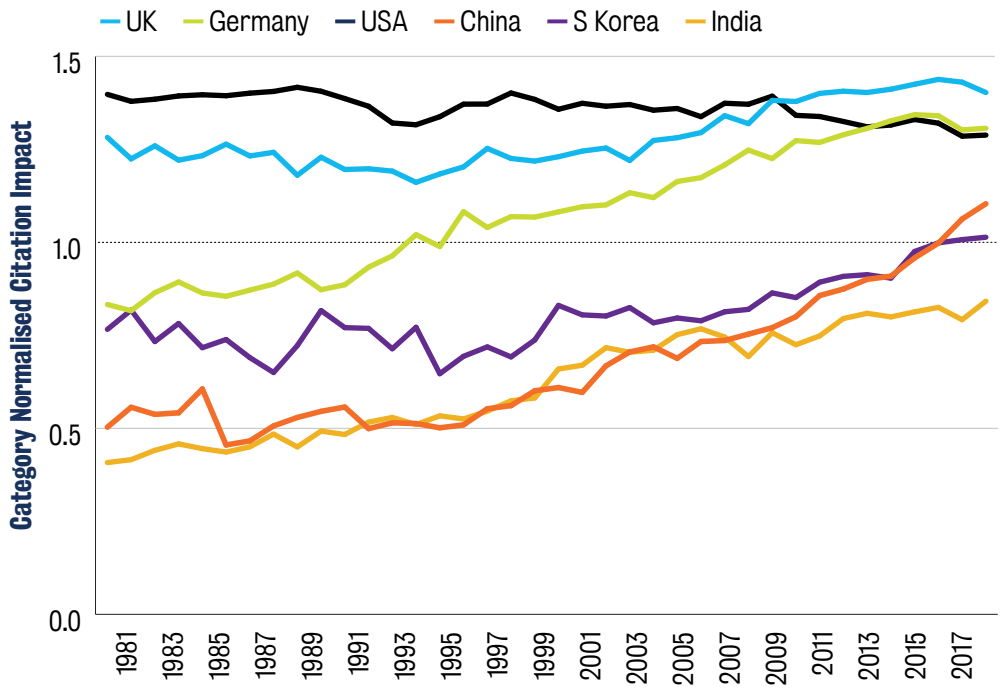
Papers as average annual count (by broad subject area for five-year windows through 2001 to 2020) and as percentage share of total India-UK collaboration. Subject areas with marked increases are shown in bold; those with marked decreases in italics

Citation impact

The quality of academic research is conventionally indexed via its influence, as reflected through citation in later publications.[78] We cannot use a count of total citations to papers as a measure of influence because citation counts increase over time at a rate that is discipline-dependent. To account for this, the citation count for each paper is compared to the accumulated average for its Web of Science journal category and in the year of its publication. This "normalisation" of citation impact enables comparisons across time and research areas. We then calculate the annual average category normalised citation impact (CNCI) for each country or institution.

The quality of India's research, as reflected in the extent to which its papers are subsequently referenced in later academic research, is rising – but more slowly than China and South Korea, and it remains some way behind the G7 nations on this indicator. Citations are only one way of assessing the impact of research and it is essential to recognise that much of India's research investment is in areas that influence local food, health and social conditions. Such research will not necessarily be referenced elsewhere but it will be of central importance to the Indian economy and quality of life. Nonetheless, such comments would also be true of China's research base, but Chinese research increasingly has global influence (Figure 24).

Figure 24: Annual average category normalised citation impact for established and growing research economies



This total profile can be deconstructed into the 21 ESI research areas reported earlier (Figure 23, Table 4). India's research capacity has increased more than five-fold in engineering, psychiatry and molecular biology and environment/ecology – areas where we show below that its relative collaboration with the UK has also risen (Table 4). In the discussion of India's research footprint (Figure 23) we noted that research areas of particular interest to potential collaborative partners would be those where

the country has both a high relative share of world papers and high relative citation impact.

An initial analysis with subject groups broadly corresponding to conventional university "faculties" provides an informative overview. It is evident that India's share of physical sciences and engineering is rising and that its average CNCI is meeting and passing world average as this activity grows. Medical sciences CNCI has risen but output share is generally low and much of the impact rise may be accounted for by international collaboration. Biological sciences' share is close to national average but the average CNCI is generally rather low – with the exception of environment and ecology (Figure 25).

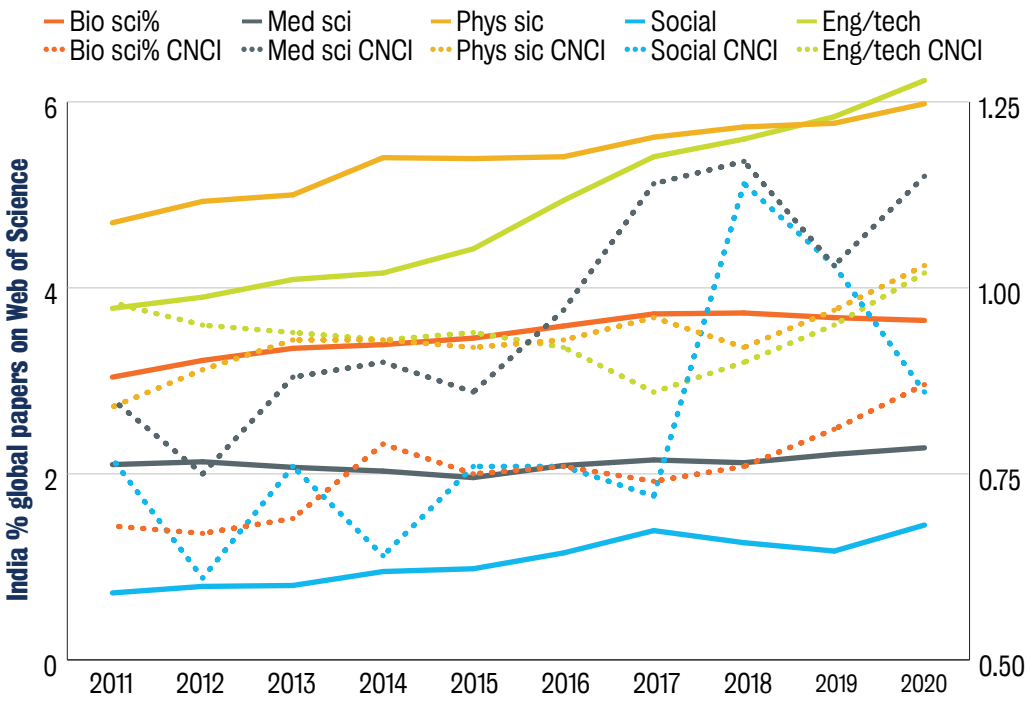


Figure 25: India annual papers (as % of world share – solid lines) and category normalised citation impact (dashed lines) in journals indexed on the Web of Science

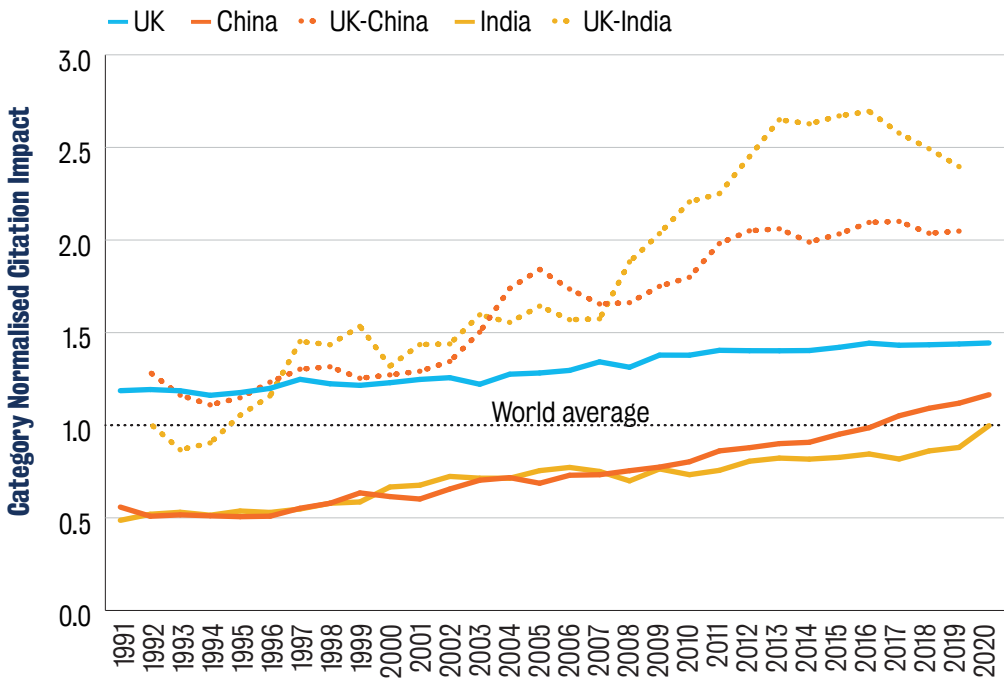
The black dotted line indicates both world average CNCI and India's recent average world share. Data is grouped into broad "faculty"-level groups. Journal articles and impact are not relevant criteria for the arts and humanities which have been omitted.

At a more detailed level, there are consistent strengths in core mathematics, acoustics, inorganic chemistry and crystallography, and several areas of engineering and materials science. This strongly suggests that it is in the research areas at the interface between the core physical sciences and engineering/technology applications that partnerships are likely to be feasible, because of capacity, and fruitful, because of recognised impact. These are areas where funding shifts have caused India-UK co-authorship to fall as a share of annual collaboration (Table 4) and this growing deficit may need to be addressed.

The average citation impact of India-UK collaborative research is now higher than the overall average of either country. In the early 1990s, UK research impact was not

only higher than India's but also higher on average than the research papers that were collaboratively authored between the two (which had impact around world average). There was then a period of marked improvement in the late 1990s that levelled off at around 1.5 times world after 2000, and a further substantial rise in the last decade that also now seems to have peaked (at about 2.5 times world). It should be noted that this corresponds to the period of rapid growth in multilateral collaboration (Figure 20). Nonetheless, the impact of UK research evidently benefits from its relationship with India, and the annual averages for the last few years have been higher than those of UK-China collaborative research (Figure 26).

Figure 26: Annual average category normalised citation impact for China, India and the UK, and collaborative papers between the UK and these two

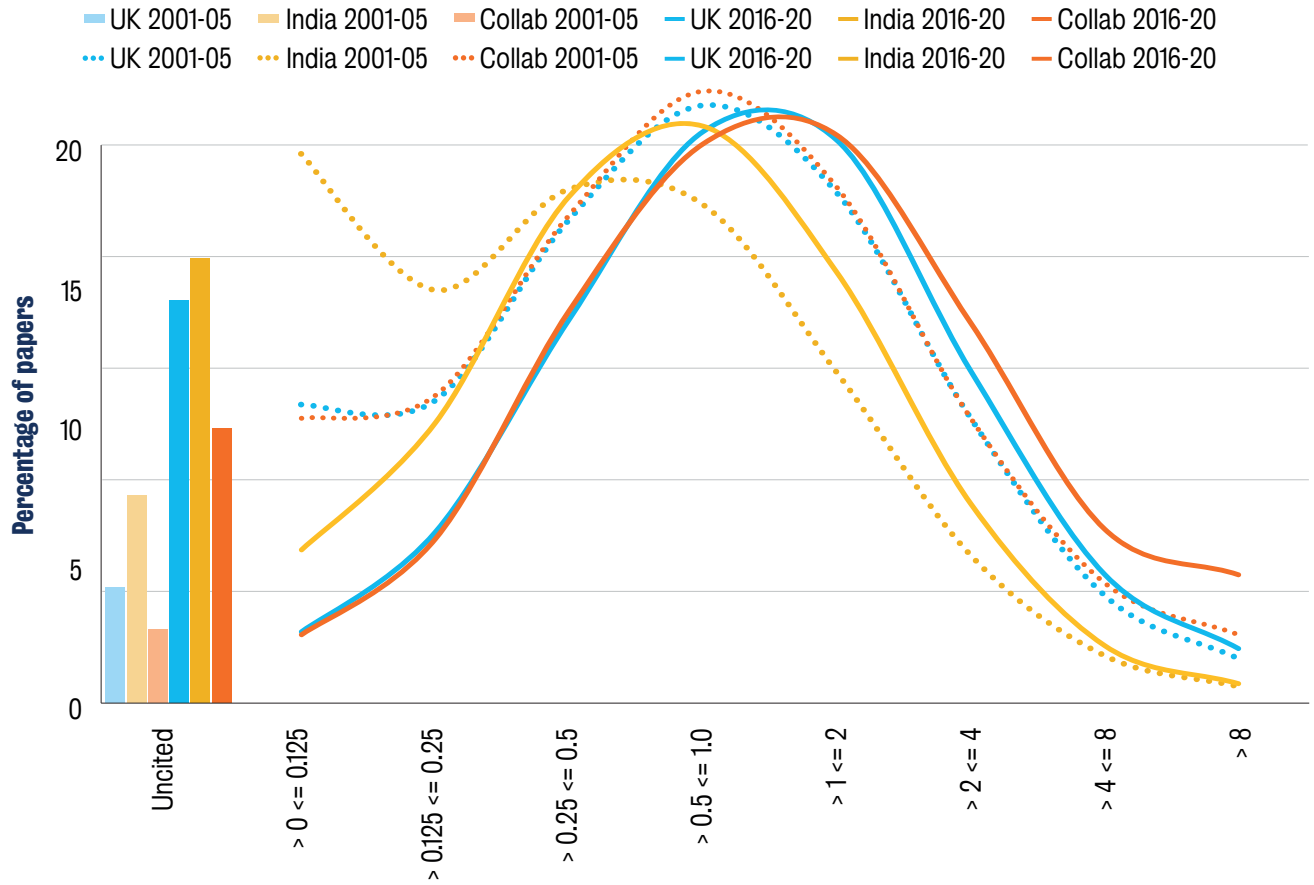


The distribution of citation counts is invariably highly skewed, with many infrequently cited or uncited papers and a few very frequently cited papers. The average of a skewed distribution may depart significantly from the mid-point or median and thus tells us little about the spread or variance of real data points. While CNCI averages are a convenient ready-reference for multiple country comparisons over time, they can also give an erroneous impression about the underlying distribution of research activity. To address this information deficit, a more informative picture can be acquired by graphing the distribution of less and better cited papers across impact categories relative to world average in an impact profile. All papers are used for this analysis and no weighting is attached to first, last or corresponding authorship. To create a profile for each entity and time period in an analysis, we first separate the uncited papers. The cited papers are then allocated to eight impact bins with four below and four above world average and with the boundaries of each bin successively doubling (eg, 0.5 to 1 times world average, 1 to 2 times world average, etc). If percentages of each total sample are plotted (to adjust for volume differences between years and entities), this produces a curve visually akin

to a normal, bell-shaped distribution that makes comparison and interpretation far easier.[79]

The relative number of uncited papers is always greater in the most recent period since they have had less time to receive citations. The citation count for cited papers is, of course, indexed for year of publication. In an India-UK comparison, the profile of cited papers for India is to the left side of the UK (ie, a greater percentage of uncited papers and papers across lower cited bins) in both early and recent periods. India's profile shifts rightwards, towards the higher cited bins, in the second period. Both India and the UK have a clear shift away from the lowest cited bins (below 0.25 CNCI of world) and this change is relatively greater for India (Figure 27).

Figure 27: Annual average category normalised citation impact for China, India and the UK, and collaborative papers between the UK and these two



Lines show the overall CNCI Impact Profile (percentage of total papers in each impact category) for each country and that for papers collaborative between the two.

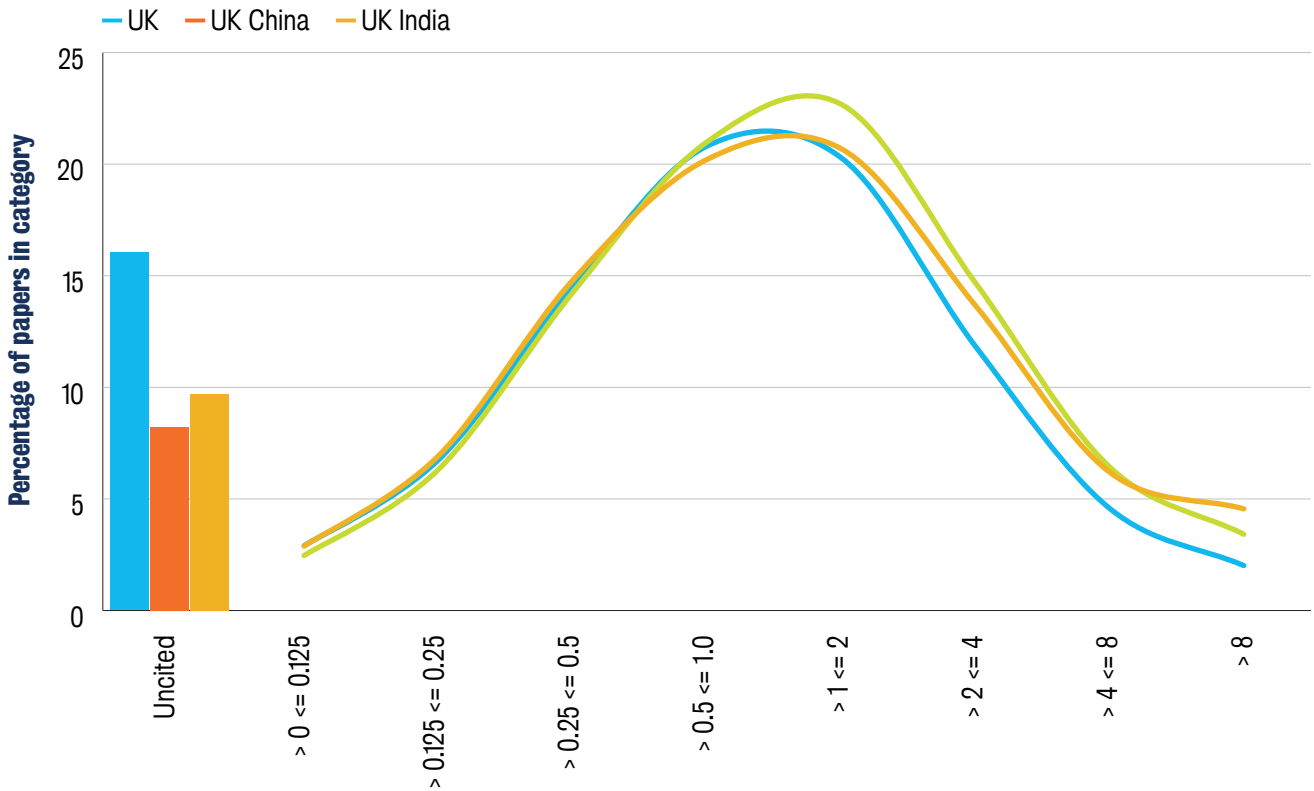
Apart from the evidence of improvement across the board, it is also important to note that although India's average CNCI is below world average (Figures 26 and 27) this does not mean that it does not have a significant body of research with CNCI above world average: about 20 per cent of India's total output was cited above world average in 2001-2005, rising to 25 per cent in 2016-2020 (compared with 32 per cent of

China and 39 per cent of UK output) on volume that had increased almost four-fold, while 10 per cent achieved CNCI more than twice world average.

Joint India-UK papers are more likely to be cited and a higher percentage of these are in the categories above twice world average. This was only marginally above the UK curve in 2001-2005 but is clearly separated from the UK in 2016-2020. The joint curve follows the UK curve closely in the categories of papers cited up to twice world average.

Comparison with the UK's joint research with China can be made here as well. In Figure 26, it was evident that the average citation impact of UK-India research now exceeds that of UK-China research. In Figure 28 the data for the most recent five years is unpacked as impact profiles, and this shows that it is in the most highly cited categories that UK-India research produces a high relative volume: 10.6 per cent of UK-India papers are in the two most highly cited categories (more than four times world average) compared to 9.7 per cent of UK-China papers. It is likely that a substantial share of these papers will have a high level of multinational authorship.

Figure 28: Impact profiles for papers published by authors in the UK and co-authors in India and China for the five-year window 2016-2020



Lines show the overall CNCI impact profile (percentage of total papers in each impact category) for the UK and for collaborative papers between the UK and the others.

Whether or not the net outcome of the UK's research collaboration with India is influenced by an element of multilateralism, the data makes clear that the UK gains much from this relationship.

Leading research institutions

There are marked differences in the structure of India's university and research systems compared with those of the UK. The UK public sector research base is concentrated in a relatively small number of large, research-intensive and well-established institutions that are predominantly multi-faculty but include some specialist colleges in the arts and social sciences. There are in total about 150 universities that annually receive grants from UK Research & Innovation, of which about one-quarter receive about three-quarters of the available research funding. The many mission-led research institutes, funded and managed by the Research Councils, that were part of the research landscape until 1990 have been reduced – although those that remain continue to produce important, high-quality work.

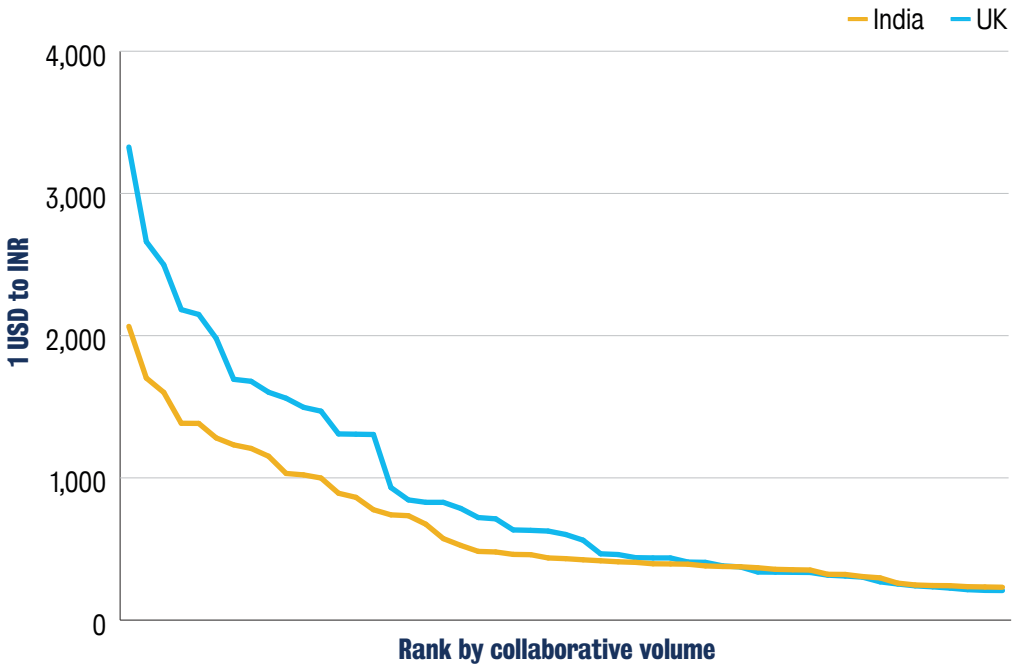
The India research base and higher education base contains many institutions with more restricted missions characterised by specialist research portfolios or a narrow stratum of students (undergraduate, postgraduate and research). Multi-faculty universities are less common and many research-intensive institutions that specialise in particular areas of research teach few or no undergraduates. Data suggest that only 2 per cent of India's 800 universities, while around 40,000 colleges have active PhD programmes and about 35 per cent have master's programmes.

As noted, some research-intensive India institutions, such as the Indian Institutes of Technology (IITs), are part of a larger parent system that covers multiple sites with a quite distinct research focus. The same issue arises with the National Institute of Technology (NIT) system, Council of Scientific & Industrial Research (CSIR), Indian Council of Agricultural Research (ICAR) and the Department of Science & Technology (DST).

The IITs and others are akin to a network like the Max-Planck Gesellschaft, rather than a UK university. For analytical purposes it is most informative to consider these as distinct sites, not least because for collaborative purposes this is how partners are likely to engage. If we consider each site of the IIT and other collective organisations in India as a separate entity for research analysis, then we find that about half of India's research publications indexed on the Web of Science over the last 25 years came from just 10 per cent. The other half is widely and more evenly distributed.

Internationally collaborative research appears more concentrated in the UK, where some institutions have a significant volume of publications across many subject areas, compared with India, where activity is dispersed with lower institutional volumes on a limited subject spread. In the UK, there are about 250 institutions, including many hospitals and corporate R&D units, that have co-authored 10 or more papers with an India co-author since 2011. An estimate of the total number of India institutions that collaborated with the UK is more difficult because of the sparser distribution, but it certainly exceeds the UK number (Figure 29).

Figure 29: The distribution of India-UK collaborative research output (2011-2020) among the most collaborative 50 institutions in each country, ranked in order of descending volume



Leading UK institutions have greater volume, whereas more Indian institutions are involved in joint research.

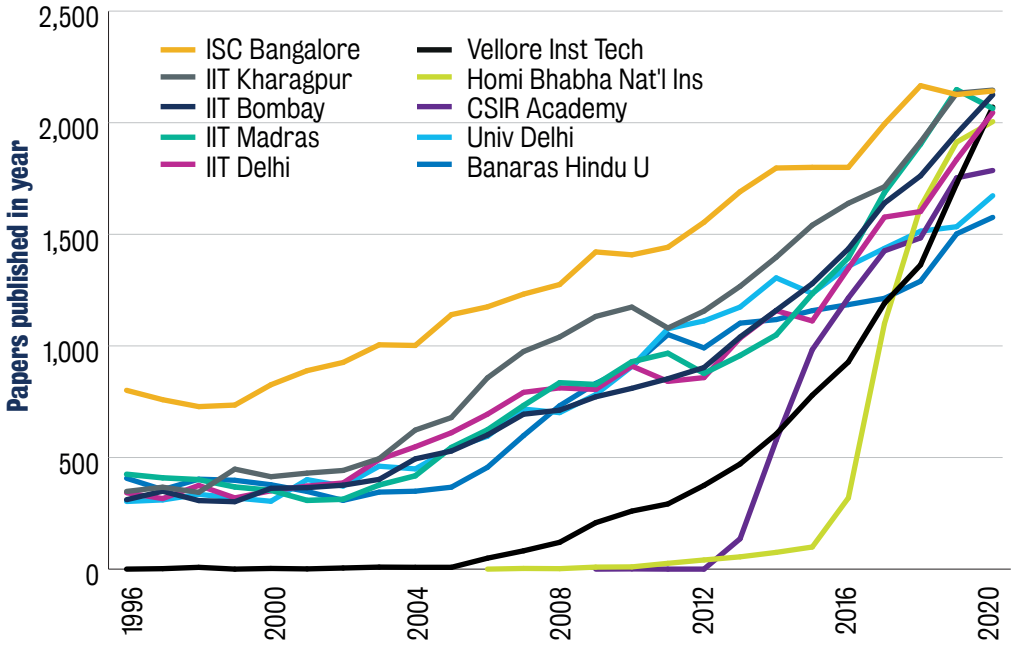
Inevitably, India's more specialist institutional pattern constrains its capacity to engage in in-terdisciplinary research at the leading edge of global challenges such as climate change. It also means that any one UK institution will typically deal with many institutions in India.

There are 23 "prolific" institutions (based on recent output, publishing more than 1,000 papers in both 2019 and 2020) and another 25 that published between 500 to 1,000 papers each year. The list is headed by institutes in the IIT system, where Madras, Kharagpur, Bangalore, Bombay and Delhi all produced more than 2,000 papers in 2020. Among the 10 most prolific of these larger institutions there has been substantial growth. The trend over the last 25 years is very clear and, for many of these institutions, reflects a common growth rate – but it is also notice-able that their output was almost static until around 2000 and then increased by a factor of three or four (Figure 30).

Three institutions appear to have grown from almost nowhere. The Homi Bhabha National In-stitute is in fact a networked organisation supported by the Department of Atomic Energy with 11 distinct sites. The Academy of Scientific and Innovative Research also has a "hub-and-spoke" organisational model across 45 main laboratories and 10 associate centres. The Vellore Institute of Technology, however, is a private "deemed university" that grew out of the Vellore Engineering College, and its growth is impressive. In fact, there are 20 India institutions now publishing more than 250 papers per year that had no indexed publications in the Web of Sci-ence before 2000. This is an informative indicator of the potential for change in the India re-search base.

The prolific institutions that do have an educational profile are also relatively highly ranked in the National Institutional Ranking Framework (NIRF), approved and launched by the Ministry of Human Resource Development (MHRD) in 2015. This framework outlines a nationally applied methodology developed from the recommendations of a core committee set up by the MHRD to identify the broad parameters for ranking universities and institutions. The parameters broadly cover: teaching, learning and resources; research and professional practices; graduation outcomes; outreach and inclusivity; and perception (reputation).

Figure 30: Annual publication output of papers in journals indexed in the Web of Science, for the 10 most prolific research institutions in India



Seven of the 10 most productive organisations (Figure 30) annually produce around 2,000 papers in journals indexed in Web of Science. As a broad comparison with the UK, it should be noted that more than 20 UK universities publish more than this, and four (the universities of Cambridge and Oxford and the University of London and Imperial College London) publish more than 5,000.

The relatively small research publication output of many of India's higher education institutions influences the extent to which they are recognised by the global research network. Specialist institutions will be known to researchers in that sector, but not more widely. Small institutions involved in international collaboration may have performance indicators that are dominated by those partnerships rather than by their underpinning domestic activity. These factors mean that interpretation of, for example, the citation impact of India's publications must be treated with caution.

Citations are, as noted earlier, a widely used indicator of research impact, and the standard calculation takes into account both the year of publication and the field of research to produce an average CNCI indicator. If the average for a recent five years (2015-2019) is calculated, then it becomes apparent that most of the India

institutions with the highest average CNCI have fewer than 100 papers per year. The world average CNCI is necessarily 1 and yet these very small, high-impact institutions have an average in excess of five times that, which implies doubt as to whether this reflects true underlying performance.

Further analysis suggests that in most cases exceptional, outlying values are the consequence of these institutions having been part of major epidemiological or similar global studies where the publications have exceptional international citation attention.[80] Because they publish little else, their unusually high-impact papers are not diluted by more typical output as would be the case in larger universities. Few have an NIRF ranking and only one of the top 100 by CNCI appears in the Times Higher Education world ranked top 500. It is, therefore, necessary to be aware of but discount these indicators for marginal research producers and focus instead on those institutions where there is a match between significant publication output and national ranking on other criteria (eg the NIRF ranking).

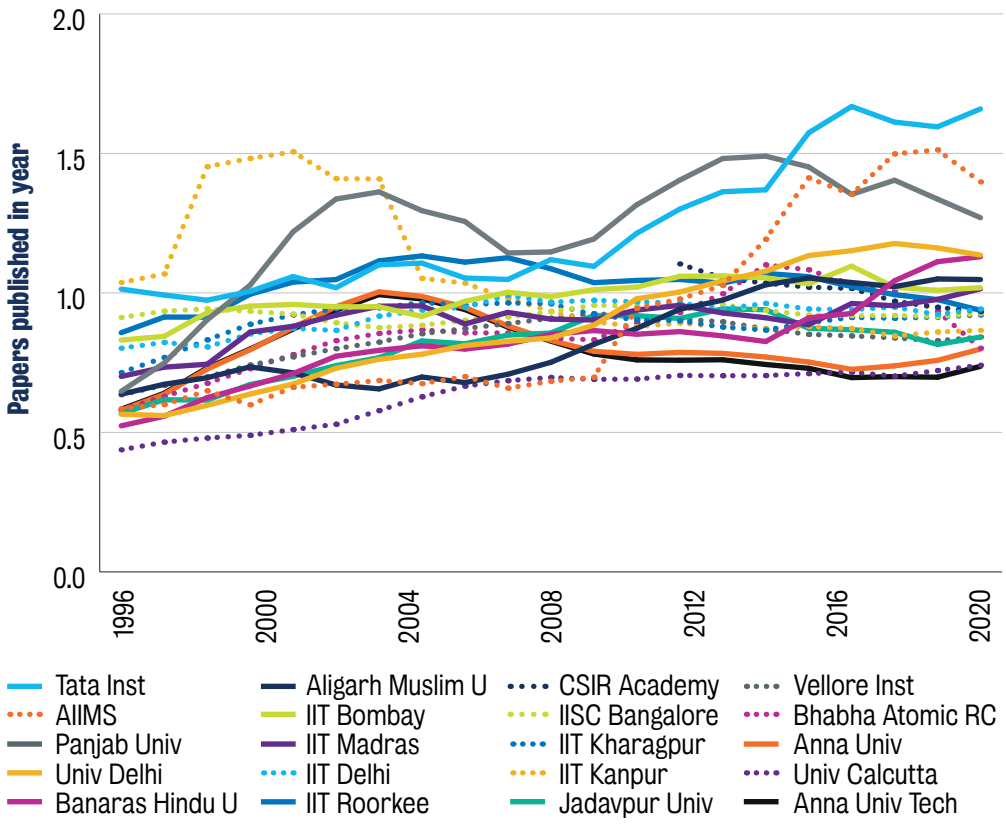


Figure 31: Category normalised citation impact (rolling five-year average) for the 20 India universities (solid lines) and research institutes (dashed lines) with the greatest numbers of papers indexed in the Web of Science

The legend is ranked in descending order of average CNCI for 2016-2020. World average is shown as a dotted red line at CNCI = 1.

Citation impact analysis for 20 organisations (10 research institutes and 10 universities) with the greatest research publication output indexed in Web of Science reveals that a majority of institutions have an average CNCI close to but somewhat less than the world average (Figure 31).

Other features are also apparent. First, there is a marked level of CNCI volatility, even with rel-atively prolific organisations and a rolling five-year average. For example, IIT Kanpur had a high average CNCI of 1.5 times world average in the period around 2000, yet its CNCI dipped well below 1 after 2007. The All-India Institute for Medical Sciences saw a marked improvement in CNCI from around 0.6 in the period to 2008, with a distinct recent peak at 1.5. The Tata Insti-tute's rising profile, on the other hand, is more progressive and sustained.

Second, the research institutes are intermediate in the organisational impact spectrum, usually just below world average, while the universities either have average CNCI well above or well below world average. Furthermore, those below world average generally improved in impact towards the early 2000s and have plateaued or even declined since. This is a distinctly different trajectory from that seen in other countries, where the typical trend is uniformly upwards across larger and smaller institutions as international collaboration becomes a pervasive influ-ence.

It will be true that every institutional "average CNCI" value is drawn from a profile distribution of high and low values, as at national level (Figure 26). It would be reasonable to expect that each research organisation will have research groups and topics with an average CNCI well above institutional average. Although it would be invidious to pick out a small number of these from the extensive India research base, the data and methodology described here shows that such an exercise is certainly feasible, and perhaps essential, for UK institutions seeking com-plementary collaborative partners.

A recent example provides an interesting model and is an example of similar partnerships that have already been put in place. IIT Kharagpur (a rapidly growing institution: Figure 30) and the University of Manchester have launched a dual-award PhD programme building on existing re-search collaboration across areas including environmental geochemistry and biomaterials. These are disciplinary areas where India has evident strengths (see Figure 25). Students will be jointly recruited and spend time in both Manchester and Kharagpur, enrolling at and benefiting from both institutions. Recruits will spend the first year at IIT Kharagpur, with the remaining time on the programme split between Manchester and Kharagpur. More such dual-site pro-grammes would be a welcome development.

Conclusions

India provides the benefit of a massive economy supporting a national network of many universities and research institutes that have the advantage for international collaborators of being an open and democratic system where research decisions are led by researchers. India is also productive as a publisher of research papers; its research workforce is as effective as any EU nation in its productivity; and the proportion of its output with citation impact above world average is expanding rapidly.

The UK's opportunities for engagement and collaboration in this environment are substantial. India is moving up in the UK league table of preferred partners, rising from 22nd to 16th in less than 10 years. There is complementarity in research strengths, which the UK could build on, balancing its current technology interface with China with similar partnerships in India and diversifying its research commitments and opportunities.

This report, like many before it, concludes that India's research base has yet to realise even a fraction of its full potential. The economy is large and world-class technology investments, including lunar landing missions, are substantial and ambitious. Nonetheless, GDP is smaller than China ($8 trillion vs $17 trillion) and GERD is a smaller share of that economy (0.7 per cent vs 2 per cent). Consequently, researcher numbers are also smaller than China (350,000 vs 1,830,000), although other sections describe developments in the education system that will progressively redress this.

India's research output is growing, but it has not grown as fast as China's, which now publishes four times as many research articles and reviews as India (Figure 18). As activity has expanded, so too has collaboration (Figure 19), and India and China have roughly the same proportion of bilateral and multilateral output. Within that collaborative portfolio, the growth of India-UK collaboration (Figure 20) has been concentrated in particular fields such as biomedicine (Table 4), which are not those where India's research base is strongest (Figure 25). The UK has much to gain from expanding the range of its collaboration, since its current collaborative activity with India has produced papers of above average citation impact (Figure 26).

The data shows that India's average national citation impact is still below world average, though it is improving slowly (Figure 24). Its impact is – surprisingly – less than might be expected in subjects with high international collaboration (Figure 25). Yet, on the other hand, the impact profile analysis also makes it evident that India produces much work of high impact, and a quarter of its recent papers are cited well above world average (Figure 27).

A partial explanation for this complex picture may be the differences in institutional structures between India and other countries with a strong research base (Figure 28). The way that research has been organised on disciplinary, mission-led lines may have made it more challenging to support interdisciplinary research and may obscure opportunities that would be more apparent on a diverse multi-faculty campus. It also makes it difficult to create institution-to-institution collaborations because any one UK university will need to seek multiple partners across its subject spectrum.

The dispersed structure of a very large network of small research institutions will also affect "average" performance indicators like citation impact. There is a pressure on all academics to publish, but many in this system are in small, weakly engaged groups that are not nearly as well resourced as the major urban institutions. The consequence is a "long tail" of outputs that may be only loosely connected to national priorities and projects, get little attention from larger research groups, and are thus rarely cited. This dilutes the overall pool of achievement and brings down the overall average national citation impact.

At some of the largest institutions, there has been very rapid growth of activity and output (Figure 29) accompanied by improvements in citation impact, particularly among universities rather than specialist IITs (Figure 30). Current plans for further reorganisation of India's system through the National Education Policy 2020, discussed in the introduction to this report, may free up the research potential even more rapidly. Consolidation and grouping around large, multi-faculty universities will provide, as intended, a wider range of degree opportunities for India's students. It will also provide exciting new opportunities for India's researchers and for their partners in the UK, who can then build on the high-quality, joint research that already occurs by expanding into interdisciplinary areas that draw on India's technological research strengths.

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For the appendices to this report, visit: https://www.kcl.ac.uk/policy-institute/assets/uk-india-appendices.pdf

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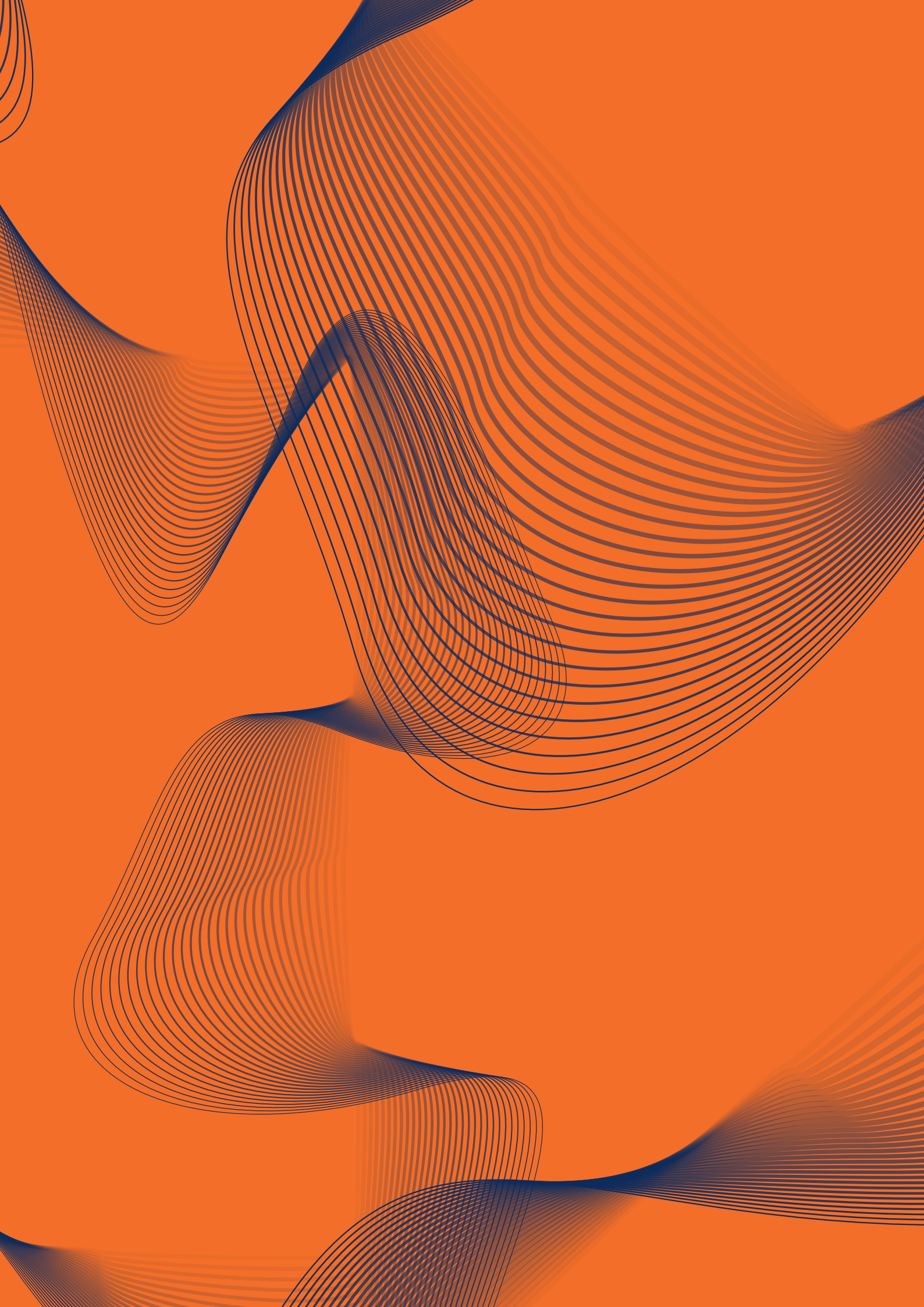

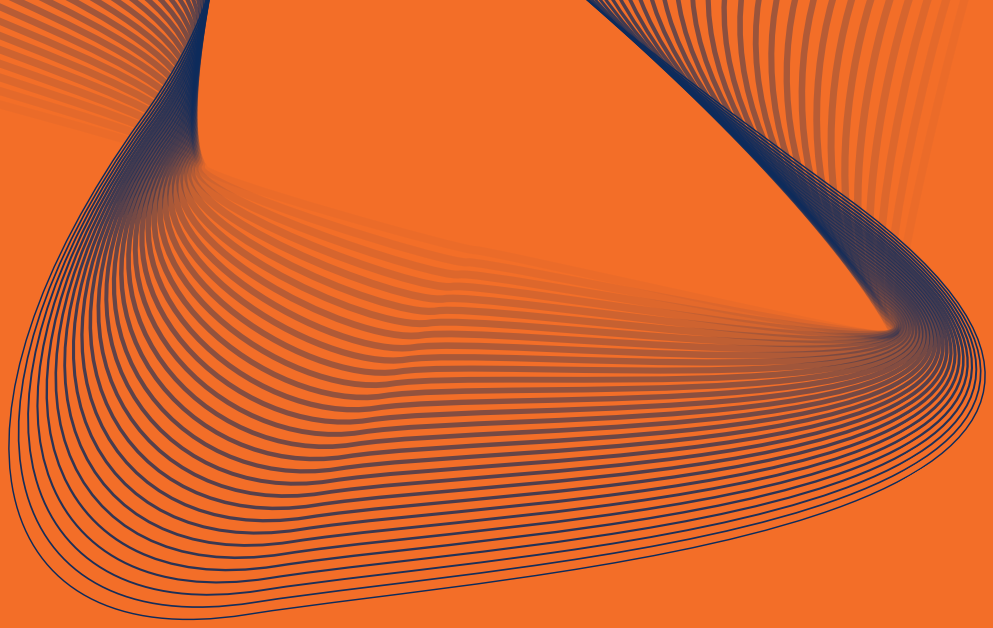

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