TAKSHASHILA INSTITUTION

The Geopolitics of Indian Talent

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Takshashila Internal Conference Compendium 2024-16
Version 1.0, September 2024

This document is a compendium of four working papers presented at the July 2024 Internal Conference organised by the Takshashila Institution on the intersection of talent and geopolitics. The papers featured in this document cover three key topics: first, the contributions of India's diaspora and high-tech talent; second, avenues to identify and harness high-skill talent; and finally, recommendations on how to skill India's human capital.

Recommended Citation:
Satya S. Sahu and Vanshika Saraf, Adya Madhavan, Rijesh Panicker & Arindam Goswami, "*The Geopolitics of Indian Talent*," Takshashila Internal Conference Compendium Document No. 2024-16, September 2024, The Takshashila Institution.

Executive Summary

The development and deployment of high-tech talent have become inextricably linked with the development of national power in an increasingly complex and competitive geopolitical landscape. With its unique demographic potential, India is well-positioned to strategically leverage its human capital at home and abroad, which could be vital to achieving its geopolitical and geoeconomic goals in the 21st century.

The Takshashila Institution organised its Internal Conference on July 24, 2024, to understand how the race for high-tech talent affects and is, in turn, affected by considerations of diaspora and geopolitics. Takshashila's in-house scholars, Satya Sahu, Vanshika Saraf, Adya Madhavan, Rijesh Panicker, and Arindam Goswami, presented working papers covering diverse topics related to the theme.

Anushka Saxena chaired the conference. This document is a compendium of four working papers presented at the conference.

The first paper employs case studies of the influential Indian diaspora in the US and Gulf states to explore their role in shaping bilateral relations by advocating for India's interests. The diaspora has facilitated a select few policy changes and positively influenced perceptions of India. However,

translating this into tangible foreign policy outcomes has proven to be challenging.

The second paper attempts to develop a framework for India to engage its high-skill diaspora to accelerate the development of high-technology sectors. To do so, it identifies the unique characteristics of this 'high-value diaspora talent' (HVDTs), maps out the key objectives of such engagement, and suggests different modes of engagement based on these objectives.

The third paper examines how India can position itself in the intensifying global competition to attract the best and brightest talent worldwide. Key recommendations include focusing on STEM research, targeting China as a development partner, and creating "talent SEZs" in tier-2 cities.

Finally, the fourth paper recommends strategies for aligning India's domestic skill development goals with the demands of shifting geopolitical trends. Key suggestions include establishing AI and quantum computing centres of excellence, fostering defence-academia collaboration, and creating a universal skill development program.

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I. Exploring the Role of India's Diaspora

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Introduction

According to the World Migration Report, as of 2020, approximately 3.6 per cent of the world's population resides in countries where they were not born. This 281 million-strong group does not even include second-generation migrants, so the overall number is likely to be even higher, and numbers are likely to have gone up since 2020. With an increasingly interconnected world, the flow of information, capital, goods and people is much easier than ever before, facilitated by faster and more accessible transport as well as easier access to education and job opportunities abroad.

The word diaspora means 'to scatter' and is used to refer to populations who have dispersed across the globe. It is important to make a distinction between diaspora- groups who move abroad for professional or educational ambitions and settle there while they continue to maintain ties with their country of origin: and immigrants, who are forced to flee their countries due to circumstance. The growing numbers of skilled migrants abroad and their presence, especially in critical sectors, allows them to contribute to their home countries through remittances and have the potential to influence

political decisions and play a pivotal role in shaping how their host countries perceive their country.

After looking at two examples of the contributions and impact made by diasporas, this paper seeks to determine if diasporas have shaped international relations in the Indian context through two case studies: Indians in the Gulf countries and Indians in the United States, and look at what other diasporas have done through the examples of Iraq and China.

On Iraq and China: Effective Diaspora Diplomacy?

While it is hard to quantify the non-economic role played by diaspora in shaping policy, it is widely understood that the Iraqi diaspora in the US played a significant role in influencing the United States invasion of Iraq and the overthrow of Saddam Hussein's regime. It was also a multifaceted example of the role played by migrants in that the US government also used the diaspora to legitimise their actions.

The Iraqi diaspora is relatively small, but they formed the Iraqi National Congress (INC) to mobilise Iraqi migrants to work towards the removal of Hussein and attempt to bring about a shift towards democracy in Iraq.

The INC was later a recipient of US government funding as well. Leaders from the INC, along with welcome allies from a think tank called The Project for the New American Century (PNAC), lobbied for their demands in Congress, and the Iraq Liberation Act was passed in 1998.

Opposing the invasion of Iraq was equated with being against democracy by the lobbyists since the invasion of Iraq would be a step in the democratisation of Iraq, which only further pushed the government to allocate funds to the cause. During the second Bush administration, some members and representatives of the INC and PNC assumed roles within the government and helped make the case for the invasion of Iraq and the removal of Saddam Hussein.

Similarly, in the early 90s, the Chinese diaspora was seen as an economic force to be reckoned with, and this ultimately led to China's own economic transformation into a global power. After China chose to open up its economy in 1978, the Chinese economy did not have enough capital to attract major foreign investors yet, and it was the diaspora who made sizeable FDI contributions- while they had no guarantee of returns out of goodwill, loyalty and their own ties they poured in investments after becoming successful elsewhere.

The diaspora also had a role to play in creating China's special economic zones, and they contributed enough capital and technology to kick-start

China's export market. Today, this role has taken on more complex characteristics, with a much broader global reach as well.

With a formidable economy, China now wants to improve technologically. Their education system has improved exponentially since the 90s, and many Chinese students continue to receive education at foreign universities. This enables a cultural exchange, as well as a transfer of knowledge. The gaps left by the Chinese education system get filled in at the professional level with inputs and contributions from those educated abroad. This transfer of knowledge facilitated by the diaspora has enabled China to become a major player in the IT sector, and many Chinese firms now collaborate in Silicon Valley.

Chinese diaspora policy poses Chinese abroad as 'ambassadors of China', and Xi Jinping views overseas Chinese as playing an 'irreplaceable role' in China's rise as a global power. The second half of the 20th century was when China realised that their international perception was not very favourable at all, and they have been working on rectifying that since then. Because there is a gap in information due to China's media laws being so stringent, much of what the world knows about China comes from their interaction with its diaspora.

Investigating the Indian Diaspora: The Gulf States and the US

With millions of migrants from India going abroad every year– largely for work or education, the Indian diaspora is one of the largest diasporas today. India also receives the highest remittances from abroad, having received a whopping 107 billion dollars last year. Some of the most significant international migration corridors stem from India, with 3.47 million Indians in the UAE, 2.7 million in the United States, and 2.5 million in Saudi Arabia.

Given their sheer numbers, these groups have tremendous potential to contribute to India's foreign policy, political interests and various other spheres, ranging from economic growth to scientific collaboration. The following section examines the different cases of Indians in the United States and in the Gulf. It seeks to determine what the benefits derived were, if any, and what factors influence how migration can impact international relations.

Indians in the US

Today, the Indian diaspora in the U.S. comprises approximately 1.5% of the United States population, numbering 4.8 million people. This massive population of Indian Americans is partly a product of the shift in India's diaspora policies in 1990, the number of skilled Indians in fields such as

medicine, tech and engineering, and in part due to the demand for professionals in these fields in the United States.

A few numbers about these groups shed light on the demographics: 80% of Indian Americans hold at least a bachelor's degree and 49% possess advanced degrees– higher than US-born populations. Additionally, Indian American households have a median annual income of approximately 150,000$ significantly higher than the overall median of 70,000$ according to the Migration Policy Institute as of 2022.There is an abundance of literature on soft power and diaspora diplomacy, which occurs because Indian Americans in the US are employed in multiple 'high-skilled' sectors. However, two examples are widely cited when talking about the influence of the Indian diaspora.

The first, is the involvement of Indian-Americans in brokering the India-US Civil Nuclear Agreement. The Indian diaspora's political presence in the form of various organisations, such as the United States India Political Action Committee (USINPAC), was involved in lobbying in Congress and pushing for the deal. The economic contributions of the Indian-American community also only added weight to their lobbying efforts, as did the visibility of the Indian American community through cultural interactions, which helped foster a deeper understanding of Indian culture, strengthening the case for bilateral ties.

The National Federation for Indian American Association also played an essential role in the years leading up to the India-US Civil Nuclear Agreement, where they lobbied for the removal of sanctions against India after India's nuclear testing in 1998. While many attribute the signing of the nuclear deal and the removal of sanctions to diaspora diplomacy, the evidence– or lack thereof suggests that the extent of the role of the diaspora may often be overemphasised.

A few key points highlight this argument. Firstly, while the Indian American lobbyists pushed for the deal, there was a strong non-proliferation lobby, that also affected the prevalence of the Indian narrative in popular discourse. Additionally, while the lobbyists may have been very local, at a senior level where policy decisions were actually being made they lacked representation. Finally, while the number of Indian Americans may be high, this did not translate to equivalent voting power, with evidence to suggest that they did not constitute enough of the electorate to sway major policy decisions. While it is likely that the lobbying and advocacy may have augmented the sentiment that was already prevalent, it is unlikely that it was the driving force behind the signing of the nuclear deal.

The second area where significant changes have occurred partly due to Indian-Americans are the modifications made to the H-1B Visa Program. The H-1B Program makes work visas available to those with a minimum of a bachelor's degree for three years and can be extended if the individual's

green card petition gets approved. They are typically awarded to those in fields such as architecture, software engineering, and medicine, which require high degrees of specialisation and advanced educational qualifications. The H-1B visa is coveted because it allows visa holders' spouses and children to come with them and allows them to change jobs within the US, provided that the new employer also applies for an H-1B visa. All these provisions make for a pathway to permanent residence in the US.

In 2020, President Trump suspended various immigration categories, including issuing H-1B visas. Additionally, the Trump administration had already been pushing for 'jobs for Americans' and tightening regulations on immigration. Indians are the highest recipients of H-1B work visas and these regulations were met with strong opposition. In response, Indian tech workers – a large proportion of the beneficiaries of H-1B visas – and organisations such as USINPAC and NASSCOM actively opposed the measures. They highlighted the contributions of H-1B workers to the United States and the potential repercussions of stringent measures on the tech industry.

Notable figures, including leadership at tech giants like Sundar Pichai and Satya Nadella, opposed the regulations, and multiple tech companies with large Indian American populations filed lawsuits. Finally, a federal judge in California blocked the rules in October 2020 because the administration did not have enough grounds to change the rules on H-1B without following due

process. However, as of now, there continues to be a constant struggle with the H-1B visa guidelines, even today it is not easy to have H-1B visa approval and the Indian diaspora and Indian government alike continue to try and ease that process.

While in both these cases, it is hard to measure the Indian diaspora's contributions, due to the lack of any concrete metrics to quantify lobbying and advocacy, they both bring out the influence of the Indian American Community. However, despite large numbers and a significant presence, there has been no determinable causal relationship between lobbying and advocacy and policy changes. Even where policy changes have been institutionalised, there is no indication that diasporic action has helped improve bilateral relations.

Indians in the Gulf

Before the discovery of oil, the Gulf countries (Bahrain, Kuwait, Iran, Iraq, Oman, Qatar, Saudi Arabia and the United Arab Emirates), were not as wealthy or powerful as they are today. Although petroleum was discovered earlier, it was only during the oil boom in the 30s that it became a key driver for the economies of the Gulf countries. While there was a significant proportion of Indians in oil companies, it wasn't until the 70s, when the price of oil rose drastically, that the rapid levels of development we see today began. This led to a shortage of labour in largely manual sectors that created a

massive demand for unskilled labour. Soon enough, there was an influx of Indian workers in various sectors.

Data from 2008 revealed that Indians in the Gulf were primarily engaged in manual labour, with about 70% of migrants working at construction sites or agricultural enterprises. Only about 25% were engaged in white-collar jobs or in fields such as medicine and engineering. By 2011, this group of Indian workers in the Gulf was almost 6 million strong, and as of RTI data from 2023, it has increased by 2.8 million.

Unlike the United States, in the case of India's relationship with the Gulf states, while one does see remittances coming back and bilateral relationships between India and some of the states, there is less evidence of the Indian diaspora being able to bring about significant policy changes. This is due primarily to the demographic of the Indians working in the gulf– with a large portion of them employed in manual sectors, which tends to give them less influence and less capacity to lobby. However, this does not mean that the Indian diaspora in the gulf has not facilitated a fostering of ties between the regions and cultural exchanges that help cement the relationship.

Due to the sheer number of Indians in the region, a sense of Indian culture has permeated into the region. The relatively small segment of the population in the Gulf who are employed in higher-paying professional fields has led to the setting up of various Indian educational institutions, including but not

limited to schools in the UAE, Kuwait and Qatar, that offer Indian curriculums through ties with Indian educational boards.

Cultural forums have also been set up, such as the Emirati India Cultural Council, which aims to provide a platform to strengthen ties between India and the UAE through cultural cooperation. Additionally, a number of MoUs have been signed between India and several countries in the Gulf region. India and the UAE have agreed to collaborate to improve the quality of education in both countries through measures such as academic collaborations and dual degree programmes. India and Saudi Arabia have signed a MoU that aims to increase investment and cooperation in a variety of sectors and bring about trade and investment opportunities. Qatar and India are working together to bring about financial cooperation and security and combat issues such as money laundering and terrorism financing.

Furthermore, in addition to the number of Indians in manual sectors, there are now active efforts being made to attract Indians in sectors such as tech and manufacturing. In an effort to double its GDP in a decade, Dubai is actively trying to incentivize Indian tech talent to come work in its industries and startups. However, restrictions on the overall flow of labour continue to tighten, and while attempts to attract talent in tech are being made due to attempts to exponentially grow the sector, concessions in strict migration laws are not being made in favour of Indian nationals.

The Cornerstone for India's Diaspora Engagement Strategies

India first decided to begin reaching out to and working with the diaspora during the first term of Prime Minister Atal Bihari Vajpayee, who recognised their economic and diplomatic potential. This began with awarding cards to OCIs (Overseas Citizens of India) and PIOs (People of Indian Origin), clubbed under OCI status in 2015. These cards are important because they give Indians abroad a status that still associates them with India. Then, in 2003, Pravasi Bharatiya Divas was announced. The 9th of January every year is observed as a celebration of all the contributions of overseas Indians. Mega events are organised, inviting overseas Indians to engage with the progress that has taken place and celebrating their contributions to their homeland.

Government-affiliated organisations and parties in power have tried to harness the diaspora's potential for India's interests. The India Development Foundation of Overseas Indians (IDF-OI) was an organisation that worked with the Indian diaspora for a decade until it shut down in 2018. It worked towards mobilising diaspora philanthropists to help achieve India's developmental goals. The IDF-OI capitalised on how the diaspora related to their idea of homeland through the visuals and images they used to interact with the diaspora in their digital diplomacy. Evocative imagery of poverty-

stricken India taps into a sense of guilt that the diaspora harbours about having left, which is a great tool to attract financial contributions in addition to the remittances sent back by Indians abroad to their families.

Since Prime Minister Narendra Modi came into office, India has doubled its efforts to tap into the assets, networks and potential. By May 2017, he had made 49 trips abroad, where he interacted with the diaspora and reiterated to them in his interactions and speeches that they could be a crucial part of India's development.

These measures which focus on utilising the potential of the diaspora from multiple angles and engaging with them effectively do reflect in India's high remittances and the knowledge and appreciation of Indian culture abroad, but don't seem to translate into the betterment of India's relations with host countries at a significant level.

A framework for evaluating policy changes

While one can safely say that the Indian diaspora has contributed to its international presence in certain ways, to measure policy changes in particular, a need arises for a policy framework that evaluates how diasporic groups try and bring about policy changes.

The Public Advocacy Framework that was created by Hank Jenkins Smith and Paul Sabatier in the 1980s seems apt for this case. To use the framework, one begins with identifying the 'policy subsystem': the policy area that is being looked at (eg. immigration legislation reforms). Then one must identify the policy coalitions, the groups of individuals or organisations who are involved in trying to impact the policy area. Subsequently one must understand the beliefs of each policy coalition and the goals that are driving their actions. With the information on the groups of actors, their drivers, and beliefs, one can analyse the dynamics between coalitions through how they interact and how they use resources to further their cause before finally tracking policy changes.

Tracking policy changes through this framework helps understand if the driving forces behind the policy changes are any of the coalitions, or whether there are any external factors at play that have more influence. Especially in the case of diaspora groups– where data that evaluates their contributions to policy change is not readily available, breaking down the process and using a framework such as the Public Advocacy Framework would give a much better understanding of the extent of their influence.

While applying the framework to each case study goes beyond the scope of this paper that merely seeks to explore the role played by the Indian diaspora and not evaluate the degree of its contribution, looking at diasporic action

through a robust framework will give policymakers a better understanding of their sphere of influence and how to improve it to further their interests.

Conclusion

When looking at the potential that diasporas hold, there are many instances where the Indian diaspora has facilitated cultural exchanges and increased India's soft power through lobbying, advocacy and initiatives targeted at collaboration. However, if diasporas are being seen as a tool of effective international policy changes and a means to shape international relations, there appears to be a much weaker correlation between diasporic action and a betterment of bilateral relations than is widely touted.

Looking at the two examples that have been explored previously; in the case of Indian Americans, they have the potential to lobby effectively and facilitate cooperation in sectors such as medicine and tech, where there is a significant proportion of the Indian diaspora. By virtue of being financially better off, they have more opportunities to influence decision-making and push their interests. However, due to poor organisation and inadequate representation in seats of power that translates into action, Indian Americans have not drastically improved the relations between India and the United States although they have helped advocate for Indian issues.

On the other hand, Indians in the Gulf region are more prominent in number, but due to the large proportion of them in manual sectors without access to channels that enable them to lobby and with the additional risk of losing their jobs, they do not actively make attempts to advocate for their interests and their country's interests as much.

Their value addition to their host countries comes through in the numerous bilateral agreements and MoUs. A certain trust comes with having had Indian labour in the gulf for decades, yet despite the number of Indians working in the region there is a tightening of migration regulations. The smaller proportion of Indians in fields that require more professional qualifications also seem to be perceived as skilled and capable of contributing to the growth of their host countries, but their contributions are largely monetary and have not translated into bettering the policies towards India drastically yet.

The examples of the Iraqi and Chinese diasporas serve to shed light on the ways in which diaspora *have* played a significant role in either changing policies drastically, and give a sense of how other diasporas function. The Iraqi diaspora – while relatively small in comparison to the Indian diaspora - has demonstrated significant political sway in the United States due to having a fairly united sense of what their interests are, and through having enough representation in senior levels of government who can push their agendas.
The Chinese diaspora on the other hand, have demonstrated their reach through 'representing' China, and technological collaborations. However

they too, unlike the Indian diaspora, have not been able to shift the relationship between their home country and host country in terms of major policy changes.

Finally, when attempting to harness the potential of migrants and diaspora abroad, India will have to go beyond continuing to tap into their networks and their ties with the country while also making policies beneficial to them, like the awarding of OCI status to Indians abroad.

Tapping into the diaspora's ties to their homeland will help ensure their monetary contributions, and engaging with the diaspora and having organised forums and groups working on collective issues such as the USINPAC will help organise people for advocacy and lobbying purposes.

However, to effectively change relationships between India and countries that host their diaspora, India will have to do more. As of now, engagement with diaspora is a part of India's foreign policy, but that engagement has not gone beyond an increase in soft power and cultural exchange thus far. In addition to large numbers of Indians abroad, there will need to be better organisation, more engagement, and a loyalty towards India on the part of the diaspora that goes beyond fiscal contributions to the extent that they are willing to.

II. A framework for engaging high-skilled expatriates to accelerate India's High-Tech sectors

Introduction

The United Nations estimates that there are around 281 million international migrants in the world, as of 2020. While they may only constitute around 3.6 percent of the world's total population, these "diasporas" have a disproportionate impact on the development of their countries of origin by promoting investment, trade, innovation, and access to technology.

Diasporas, have, therefore, emerged as influential transnational actors, wielding significant economic, intellectual, and cultural capital, and maintain enduring ties to their ancestral countries. The potential of diaspora talent to drive innovation and growth has been recognised by nation-states, especially as a means to overcome limitations preventing them from achieving domestic, geopolitical, and geoeconomic goals in certain "strategic" or "high-technology" sectors.

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The authors would like to thank Anushka Saxena and Bharath Reddy for their valuable input.

China has proven to be the most prominent example of such efforts to tap into diaspora talent, with its targeted initiatives like the Thousand Talents Plan (and its successor, the Qiming), seeking to attract top Chinese-origin scientists, researchers, and entrepreneurs back to the country to drive rapid advancement in key "sensitive" or "classified" areas. Although there are obvious concerns of espionage and IP-theft being facilitated by Beijing through such initiatives, further study has shown that a range of incentives (including generous research funding, state-of-the-art facilities, and favourable immigration policies), have both retained attracted talent, and helped them perform better compared to their peers abroad.

India, with its own substantial and influential diaspora, is uniquely positioned to adopt a similar approach. The Indian diaspora, numbers over 30 million worldwide, and has made significant contributions to the socio-economic, and technological development of their host countries, particularly in the United States, United Kingdom, and the EU etc. Indian-origin professionals are prominently represented in high-technology and other crucial sectors, and also occupy leadership positions in government, academia, research institutions, and industry overseas. This indicates that beyond being a source of remittances and financial flows, India's diaspora of scientists, engineers, researchers, and entrepreneurs can also act as a reservoir of intellectual capital, networks, and soft power that can help India accelerate its own advancements in these sectors.

This paper suggests a framework to inform policymakers' efforts to engage "high-skilled" members of the Indian diaspora to accelerate India's progress in high-tech sectors. To do so, the authors examine the unique attributes that characterise these individuals, the potential goals of such diaspora engagement policies, and some modes of engagement.

The scope of this paper only extends to the formulation of such a framework, and does not include specific policy interventions. That said, examples of different countries' policy measures have been included at the end of this paper to provide relevant illustration.

Some important definitions

Before we address the question of talent in "high-technology and strategic" sectors, we must also gain clarity on how these sectors are defined. Moreover, it is also imperative to have clarity about the different aspects of "innovation" or "progress" in these sectors for which we seek to engage diaspora talent. This is important since any broad-based policy intervention must start from identifying its goals, and mapping its diaspora's skills, before attempting to mobilise it.

Doing this should hopefully help answer the following questions: What sectors benefit disproportionately from the engagement of talent? Which members of the diaspora are we looking to engage with? What kind of role

do we want them to play (or what value do they bring)? What modes of engagement would best work to achieve these goals?

What is a "High-Tech" or "Strategic" Sector?

While the usage of "high-tech" and "strategic" as terminology has gained significant traction from policymakers, scholars, and industry, defining their precise boundaries and characteristics remains a complex challenge. Braja and Gemzik-Salwach, (2019) provide a comprehensive roster of core attributes that have been used to refer to high-tech. The notion of these sectors encompasses industries that are characterised by high degree of innovativeness, relatively high expenditures in R&D activities, and a constant adoption of new and complex scientific and technical knowledge.

These sectors typically exhibit higher levels of productivity, demand high-skilled talent and a robust technological base. Finally, knowledge also becomes an additional factor of production (alongside land, capital, labour).

Globally, a mix (or any one) of these factors is used by nation-states to define high-tech sectors. The OECD, for instance, uses R&D intensity as the sole criterion, while the EU goes a step further to not only cover listed high-tech sectors like information and communications technology (ICT) and

biotechnology; it also incorporates a broader ecosystem of knowledge-intensive services and the digital transformation of traditional industries.

In its methodology, the US Bureau of Labour Statistics (BLS) considers a few other factors to determine the high-tech nature of a sector, such as a high concentration of STEM occupations, high proportion of R&D employment, and utilisation of high-tech production methods (including high-tech capital goods and services).

The Bureau also attempts to define "high-tech employment" similarly; workers in these occupations inevitably tend to have specialised and expert qualifications in their respective fields, collectively referred to as "*technology-oriented workers*". Interestingly, therefore, the Bureau arrives at a definition for "high-tech industries" on the basis of the talent employed by them: ***"…industries that are technology-oriented-occupation intensive.***"

Classic examples of high-tech industries like ICT, biotechnology, semiconductors, aerospace, and artificial intelligence can be adequately covered by such a definition. This definition would also cover the sectors covered by the US-India iCET, but also perhaps cover many other sectors that may use high-tech production processes and inputs but may not be producing high-tech output.

Beyond the realm of high-tech, the concept of "strategic" sectors adds another layer of complexity to the definition. Martin C. Libicki defines strategic sectors to be those that, *"..best foster the **systematic application of knowledge** to generate more and better outputs from inputs."* This covers "*increased productivity, the creation of better products, the better match of products and services with wants and needs, improvements in the efficacy of public goods, or increased deterrent power of the military.*"

Libicki's classification encapsulates sectors and industries that may not be high-growth in nature, but could have vital use in other applications or sectors. He also importantly, suggests that sectors can be made more or less strategic by policy intervention. His classification seems to be especially clairvoyant since distinguishing between "high-tech" and "strategic" sectors has become particularly tricky as the links between high-technology, national power, and geopolitics have grown stronger, leading nation-states to view high-technology through a "strategic lens".

Consequently, this means that any such sector is now going to be characterised by a high-degree of government intervention, as countries seek to exert their influence in a domain previously defined by industry and academia.

Moreover, viewing high-tech via a strategic lens can result in permutations and combinations of different factors that can be used to define them. Marc

Weiss, in 1978, remarked that a high-tech industry is a "*new technology goods-producing industry (and related services), which are still a long way from market saturation and over production, or if they are beginning to face the problem of global competition, are now organising to make demands for government assistance.*." and that "*whatever relatively new industry these governments hope to attract automatically becomes high-tech*."

Weiss' definition was predicated on the fact that such industries are on the top of governmental priorities for their potential for **rapid and sustained job growth**. This is markedly different from the factors mentioned above, where economic spillovers are a consequence of successful high-tech sectors (and they may not employ relatively huge numbers, so branding them as vehicles of job-growth may not always make sense).

China does not seem to offer any guidance as to its classification of high-tech sectors. However, the "High-Tech Fields Supported by the State" notification includes areas (such as aerospace and new materials) that are also covered by a mix of the factors mentioned above. Further, the criteria which determine whether enterprises can be accredited as a high-tech enterprise, set out in the "Management Measures for the Recognition of High-Tech Enterprises", call for high R&D expenditure ratios, and minimum thresholds for the number of scientific and technological personnel etc.

There is significant overlap with the "Made in China 2025" initiative, which identified ten key sectors, including robotics, aerospace, and advanced materials, as strategic priorities for achieving global leadership. To make matters more unclear, the 2010 "decision of the State Council on accelerating the cultivation and development of strategic emerging industries", defines "strategic emerging industries" in terms of factors that can be used to define high-tech (such as "industries with intensive knowledge and technology") as well as factors reminiscent of Libicki's classification (such as "high growth potential and good comprehensive benefits based on major technological breakthroughs and major development needs").

Therefore, changing domestic and foreign policy priorities (like job growth, "self-reliance" etc) seem to ultimately dictate which sectors are viewed as "high-tech" or "strategic". For the sake of simplicity, we will use the US Bureau of Labour Statistics' definition for high-tech talent.

Who are these "High-Skilled Expats"?

The next step is to identify some general characteristics of the diaspora talent that we seek to engage within these "technology-oriented-occupation intensive" sectors.

Now, there are some characteristics that will be common to any highly-skilled and talented individual. Research shows that financial incentives above and beyond higher wages do not seem to be more effective in **recruiting** high-skilled talent, indicating that financial gain may play second fiddle to other non-economic factors (such as capital infrastructure, well-established talent networks, opportunity differentials, or access to good schools and health services etc.).

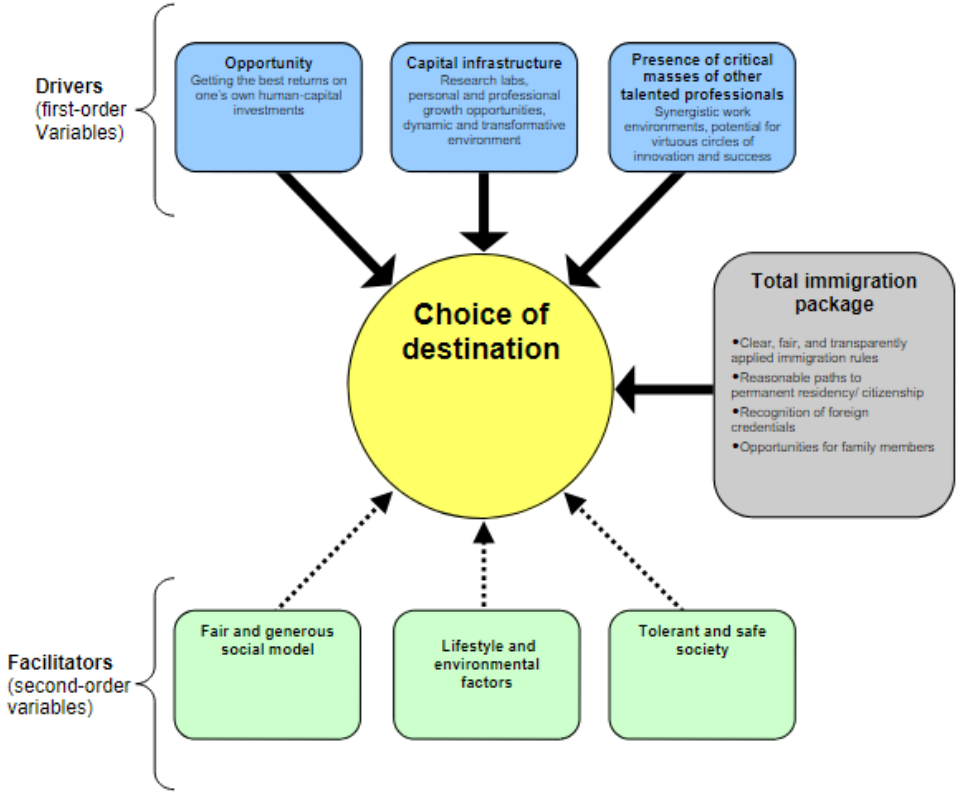
Papademetriou et al., classify this mix of factors into two different categories: **Drivers**, and **Facilitators**. The former set of variables are essential to the decision of where to move while the latter influence this decision, but don't determine the outcome.

Drivers include somewhat mutually overlapping factors such as opportunity (the prospect of commensurate returns for their qualifications, skills, and experience), capital infrastructure (facilities that enable the realisation of personal and professional goals), and the presence of talent networks (in the same or complementary fields).

Facilitators include variables like the receiving society's social model (strong welfare traditions, robust workplace norms, participatory decision-making etc), lifestyle and environmental factors, and societal tolerance (respect for diversity and multiculturalism). The impact of these variables on

immigration decision making will depend on the personal and professional circumstances of the individual in question.

Finally, another set of conditions, that has a "strong, if not determinative" impact on the decision-making process, is what the authors term the "**total immigration package**". It is the overall basket of immigration-related factors that can only be provided by governments, which determine individuals' career opportunities and experience living in the receiving country. This includes clear, fair, and transparently applied immigration rules, well-defined paths to permanent residency and citizenship, and opportunities for family members etc.



Source: Papademetriou, Somerville, and Tanaka (2008)

In addition to these, diaspora talent is unique because they often maintain strong ties to their countries of origin that distinguish them from other high-skilled migrants. These ties manifest as familial roots, shared ethnicities, cultural familiarity, and a sense of community and belonging which may make them more likely to engage with government efforts aimed at leveraging the diaspora for national interests. For instance, Indian-origin

overseas IT professionals and executives were instrumental in convincing their companies to consider setting up operations in India, and worked with newly established Indian IT firms to help them meet global quality standards. The consequences of this ad hoc mentorship are now self-evident. These diaspora-specific ties could possibly work to offset some degree of shortfall in the origin country's attractiveness when viewed through the calculus of Drivers and Facilitators.

For example, attracting semiconductor industry veterans to relocate to India would entail focused efforts to provide them with the necessary ecosystem (research facilities, location in a technological talent hub with other semiconductor firms etc.,), and a streamlined immigration process (ensuring their families and children have access to jobs and good schooling etc.,). But these individuals may be willing to compromise on environmental cleanliness or a more lackadaisical workplace environment in India because they get the benefit of having access to close family networks, or the presence of ancestral land/homes. Therefore, any effective high-skill diaspora engagement policy must also assess the interactions between the aforementioned sets of variables and factors.

Now, there are two possible choices: should policy interventions focus on chasing a significant number of individuals from within these sectors who will generally be highly educated, and have extensive professional experience and specialised skills? Or should policy focus lie squarely on engaging a select

group of diaspora members (High Value Diaspora Talent or HVDTs), who can have an outsized impact in a particular sector as compared to broad-based engagement?

The former approach must contend with variables such as short-term labour market needs in the identified sectors, as well as the immediate employability of incoming "repatriates". The latter seeks to engage individuals with a high level of human capital, irrespective of the demand-supply balance in the sector.

China's Young Thousand Talents Programme is a good example of the first approach. While there aren't many prominent illustrations of the second approach, Taiwan and South Korea's efforts to bring back their diasporic elite to advise or craft policy reformation initiatives, and lead enterprises in emerging technological sectors like semiconductors are excellent examples of both approaches being used in tandem. Indeed, Dr. Kim Wan Hee's, action plan for enacting the Electronics Industry Promotion Law, in 1968, created the foundations of S.Korea's high-tech electronics sector which became the focus of subsequent successful, high-skill diaspora engagement policies.
Therefore, the choice of which diaspora segment to engage also depends on the roles we want them to play in an identified high-tech sector, or the kind of impact we would want them to have.

This brings us to the question of what exactly do we want the influx of high-skill diaspora talent to achieve? There are broadly three ways in which high-skill diaspora talent can impact identified sectors in the origin country.

First, they can help accelerate the **iterative and gradual progress** of a particular sector. For instance, HVDTs in the semiconductor and AI sectors overseas, can provide much needed VC funding as well and mentorship to Indian chip design companies.

Second, high-skill diaspora talent (specifically entrepreneurial HVDTs), may accelerate the **development of ecosystems** in an identified sector, and **lead disruptive transformation** of technology and markets. For instance, TSMC's success story today is directly attributed to Morris Chang's realisation of the contract foundry business model, which in turn, also catalysed the establishment of fabless startups clusters in Taiwan.

Third, they can also be instrumental **in revamping or helping establish institutions and policy efforts** to vitalise aspects of a particular sector. As mentioned earlier, Dr. Kim Wan Hee essentially created the roadmap for South Korea's export-oriented policies, which has, since, resulted in its significant foothold in the global electronics industry.

Potential Modes of Engagement

Countries of origin can leverage their high-skilled diaspora to accelerate the development of domestic high-tech industries through three primary modes of engagement: incentivising physical relocation, influencing host country policies, and mobilising diaspora capital and expertise.

First, the most direct approach to harnessing high-skill diaspora talent is to incentivise them to physically return, either permanently or temporarily. Governments can offer targeted incentives such as senior positions in universities, research institutes, and state-owned enterprises; research funding and facilities; tax breaks and subsidies for entrepreneurs; and streamlined paths to citizenship for family members. When resorting to this mode of engagement, all three sets of variables (Drivers, Facilitators, and Total Immigration Package) that influence the diaspora's decisions to relocate, become relevant.

This mode of engagement has been a cornerstone of China's diaspora engagement strategy through the targeted recruitment of top overseas talent. The TTP and related initiatives offer generous incentives to lure back leading scientists, researchers, and entrepreneurs, including premium salaries, research funding, lab space, and streamlined immigration procedures for

families. These programs have successfully attracted thousands of high-calibre professionals, predominantly of Chinese origin, to key technical fields.

Second, when physical return is not feasible, countries of origin can still benefit from high-skill diaspora talent by lobbying for favourable policies in the host countries where they reside. In this mode of engagement, diaspora organisations and HVDTs, driven primarily by their "diaspora identity", can advocate for trade, investment, technology cooperation, and immigration policies etc., to favour particular high-tech sectors in their countries of origin. For example, the Indian diaspora, especially in the United States, played a pivotal role in lobbying for the US-India Civilian Nuclear Agreement of 2008, which opened the door for American firms to participate in India's civilian nuclear industry.

Third, high-skill diaspora (HVDTs, in particular) can serve as a source of venture capital, networks, and knowledge to support technology entrepreneurship and skill development within their sectors in countries of origin. Diaspora investors and mentors, familiar with both home and host country contexts, are uniquely positioned to identify promising ventures in their sector of expertise, and guide their growth. For example, the Indian IT diaspora aided in the growth of India's software industry, not just by re-migrating and starting their own firms, but also enabling knowledge exchange through informal and formal means – *"..encompassing support to*

new business formation, mentoring, access to business contacts and new markets, and provision of employment..".

Beyond physical repatriation, China engages its high-skilled diaspora through transnational knowledge networks. Government agencies and tech companies frequently invite overseas Chinese scientists and entrepreneurs to give lectures, participate in conferences, and advise on research projects.

Putting together the framework

Working back from some common policy objectives of engaging diaspora talent in "high-tech" or "strategic" sectors will be to capture their highly specific talents and skills; to attract targeted capital inflows from them; develop institutional and industrial capacity; and to (ethically) influence policy in their host countries.

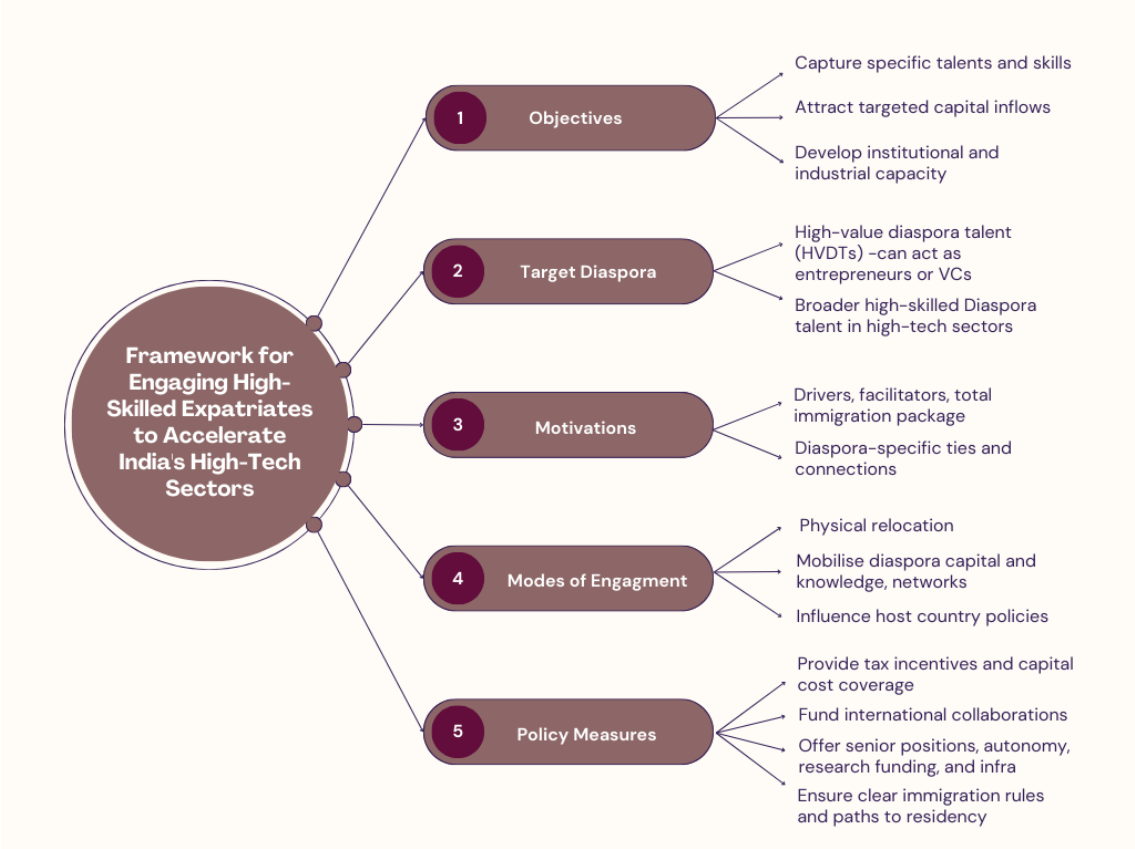
However, different objectives will require engaging with different segments of the high-skill diaspora. Further, depending on both these factors, some modes of engagement will be more effective than others in achieving these objectives.

Based on this understanding, we propose the following illustrative framework:

Objectives to Achieve	Target Diaspora	Policy Measures	Case Examples
Indigenous investment in high-tech production	Venture Capitalists in high-tech production Entrepreneurs in high-tech production	Tax incentives and covering capital costs for the first five years for Indian VC/ entrepreneur diaspora funding branches/ enterprises in India// enable not-for-profit philanthropy in critical national projects	Pharma, IT PLIs/ International Development Foundation- Overseas Indians
Indigenous investment in high-tech Research	Think tankers and university scholars	MEA-led funding for international collaborations between Indian higher ed institutions/ labs and foreign ones	USIEF/ VAJRA, INSPIRE, Ramanujan Fellowship, VAIBHAV

Return of diaspora as employees in identified high-tech sectors	Mid-Senior level Indian employees in startups/ established firms abroad	Establishing Industry-specific visas / Mobilisation of Indian Ministry of Overseas Indian Affairs' 'Know India Programme'/ guarantee Scholarship Programme for Diaspora Children (separate merit with nomination list)	Chipmaker's Visa/ 2023 KIP on India Stack and DPI/ SPDC
Shape Indian policy on incentivising high-tech growth	Tech consultants and legal advisors for high-tech enterprises	Replicate the USAID model of funding foreign consultants attached with a friendly country govt agency + Assure National Pension scheme with	USAID funding consultants with Indian MHA/ NPS for NRIs (18-60 years old)

		100% nominee guarantee	



Authors' Visualisation

III. Competing for Global Talent

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Introduction

Highly skilled workers are vital in today's knowledge economy. Talented individuals make highly impactful contributions to scientific discovery and innovation, while skilled and experienced leaders and managers are crucial to coordinating and guiding the actions of others. The mobility of talent, therefore plays an important role in propelling economic growth and knowledge accretion and is an essential lever in enhancing productivity in an economy.

Talent migration is a complex dynamic system and results from the interplay between multinational firms, local firms searching for talented employees, academic institutions both attracting and producing the next generation of talent, governments seeking to manage migration flows while managing talent supply in the economy; and individuals optimising for the best options available to them.

This paper looks at the importance of global talent to growth and productivity and considers India's options when competing for talent. Over the next decade, we will see increasing protectionism and nationalism leading to a possible restriction in labour mobility globally. At the same time, labour

competition will only get fiercer as today's favoured destinations like the U.S., E.U., Australia and Singapore will continue to ratchet up their search for skilled migrants with the relevant skillsets in emerging and critical technologies of tomorrow.

This paper only examines migration and labour competition in critical and emerging technologies. The assumption is that this is the migration that matters from a growth perspective—of course, providing overall mobility of labour matters, especially for India's large working-age population.

Why Global Talent Matters?

A 2020 study on the importance of global talent by NBER shows significant advantages accruing to the US and other developed countries from skilled migration. Nearly 17% of the highly skilled, employed male population in the U.S. were migrants, with the number going up to almost a third per capita in STEM occupations. Using a cohort of Nobel prize winners since 1901, inventors (WIPO database of patent owners) and college graduates to proxy varying skill levels of migrants, the paper finds that migration levels tend to go up with skill level, with Nobel winners nearly six times more likely than college graduates to migrate abroad.

Similarly, their research indicates that almost 10% of all inventors worldwide were migrants, with top inventors five times more likely to migrate than less productive inventors.

The U.S has attracted a considerable share of this talent migration, attracting nearly 54% of all Nobel winners and almost 57% of inventors in the period measured. The chart below shows us that the US attracts an overwhelming share of inventor emigrants globally.

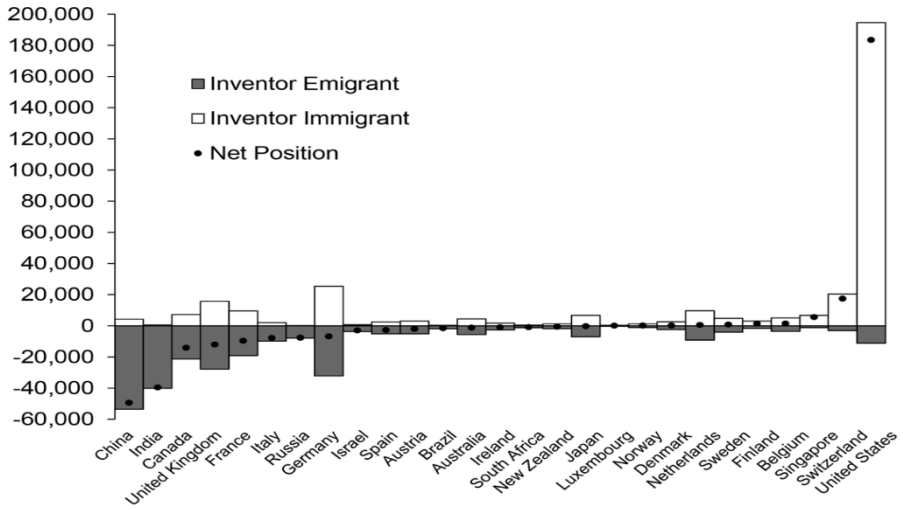


Fig. 1. Global migration of inventors during 2000–2010.
Sources: Data from World Intellectual Property Organization and Miguelez and Fink (2013).

The arrival of highly skilled immigrants coincides with a rise in the overall skill levels of those particular sectors and cities, suggesting that it was not just the ability to get paid better but also the opportunity to work in specialised and skilled labour networks that attracted local and international workers. The impact of highly skilled migrants on U.S productivity in knowledge-based sectors can be seen in the charts below, showing how strong their contributions have been using patent data from the USPTO.

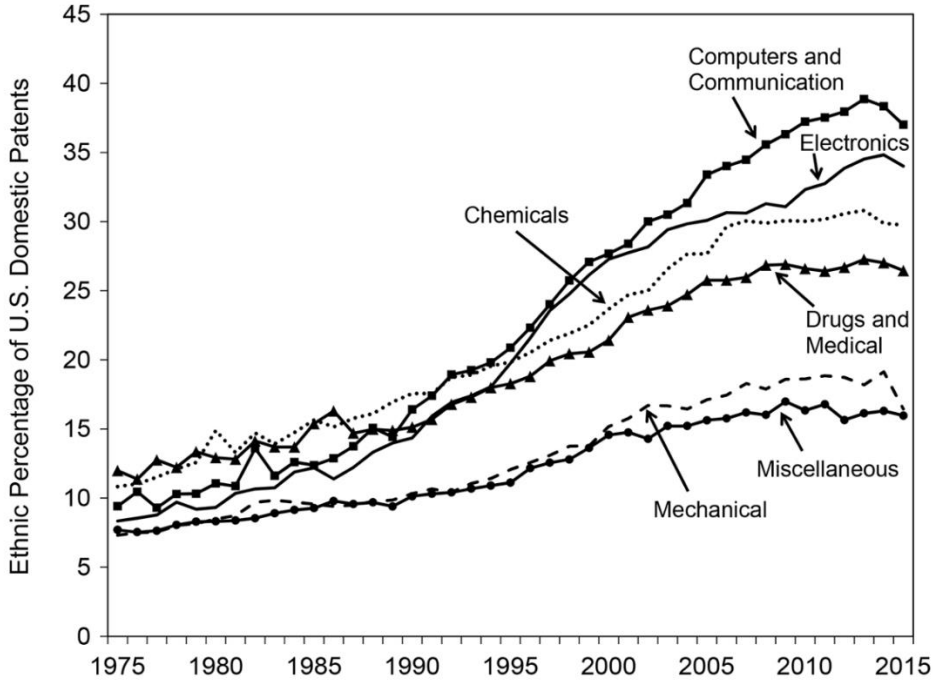


Fig. 8. Trends in U.S. ethnic patenting by technology sector. Series show the share of a sector's inventors who do not have Anglo-Saxon or European ethnic names.

Source: Data from U.S. Patent and Trademark Office.

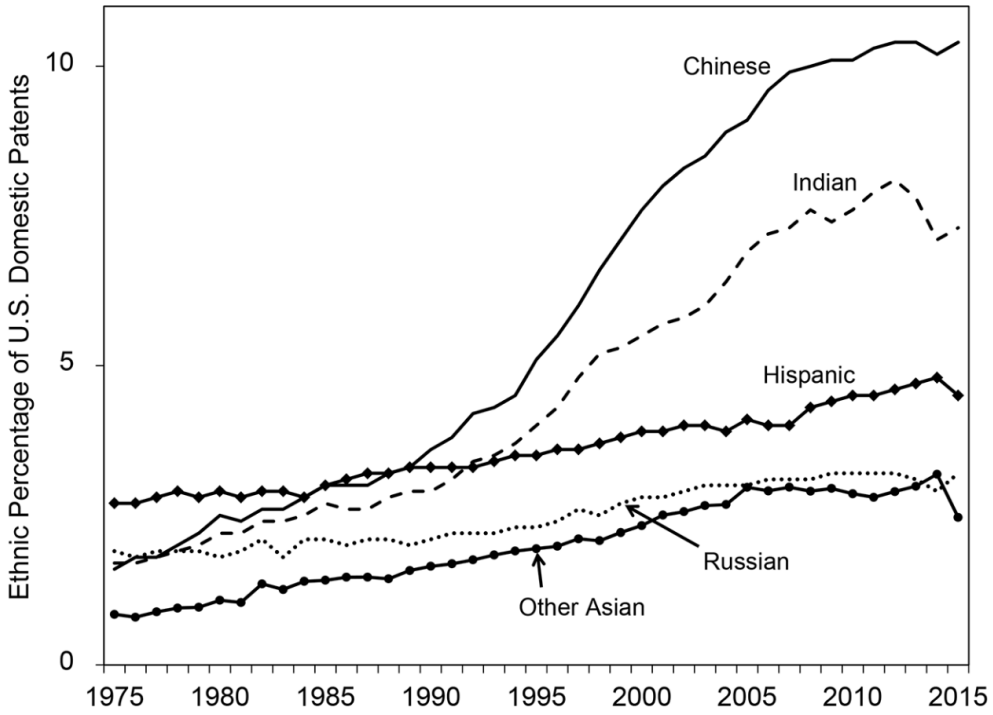


Fig. 7. Trends in U.S. ethnic patenting. Series uses ethnic naming conventions applied to inventors based in the United States.

The Battle for Global Talent

The Global Talent Competitiveness Index (GTCI) is an annual composite index measuring how competitive countries are at growing, retaining and attracting talent. The 2023 report measures how countries have done over the decade that the index has existed and identifies key trends they see in the labour market.

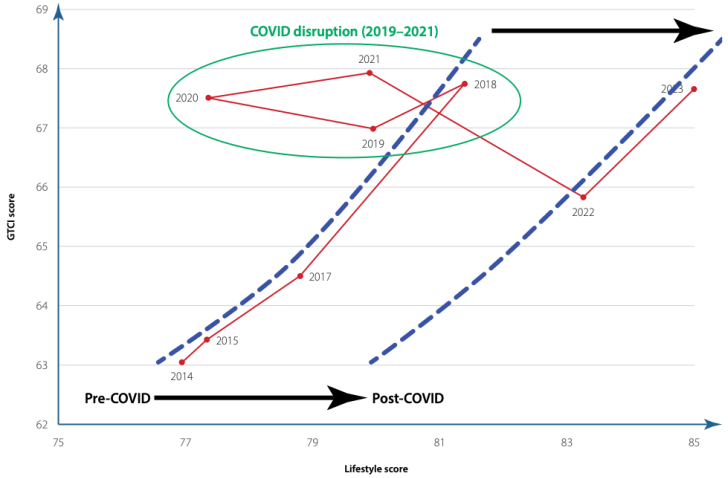
Income levels drive competitiveness

The correlation between income levels and competitiveness remains as high as ever. Higher-income countries are invariably on top in their ability to compete for talent, and the gaps between high and medium/low-income countries have only increased over the last decade.

This is also reflected in the index rankings over the last 10 years. Countries like Switzerland, Singapore, U.S. and Denmark have consistently maintained their positions at the top of the tables.

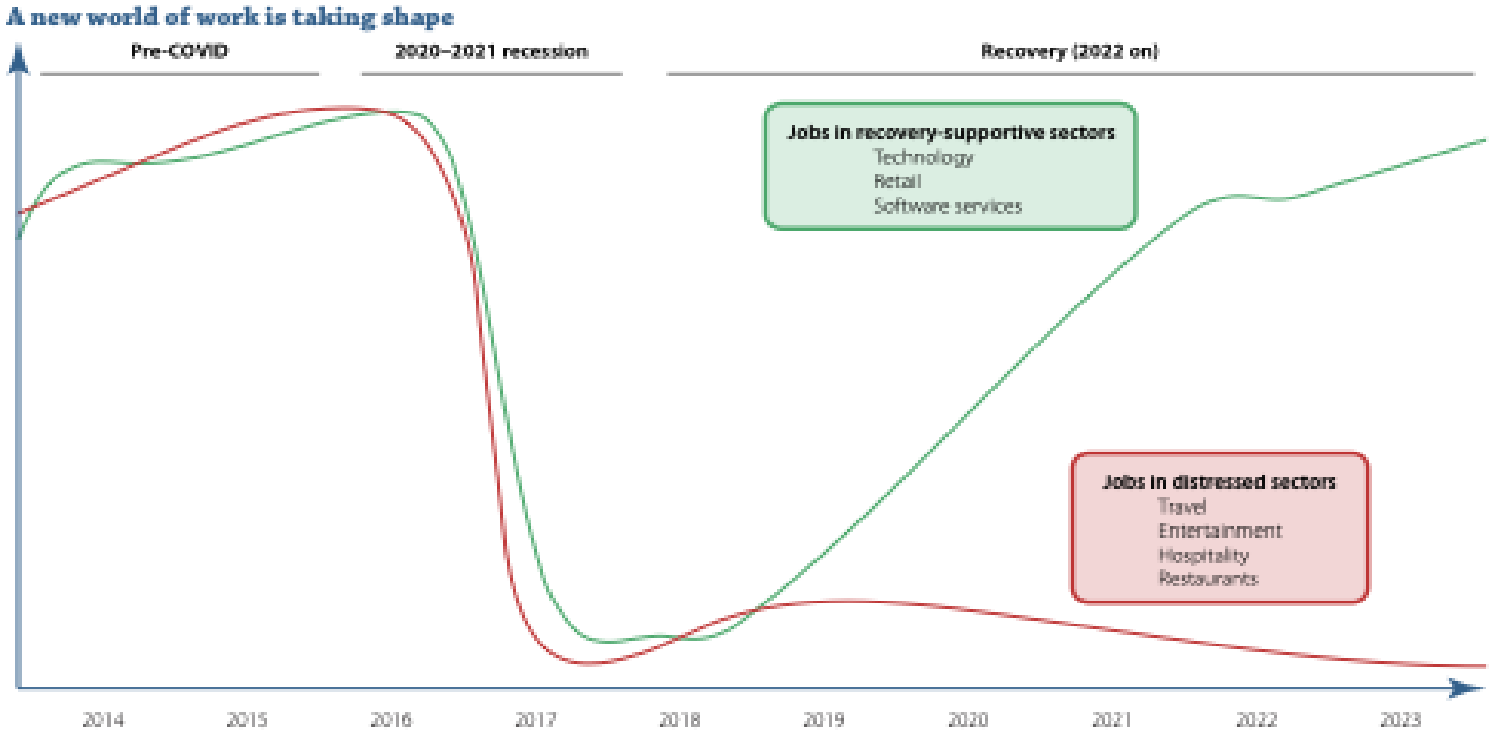
While the US has achieved its ranking because of its excellent network of institutions and growth and job prospects, Singapore has achieved its position due to it's openness and government support for immigration, strong support for R&D institutions by the government and the networking effects of focused industry development like biopolis (bio-medical technology hub).

Figure 3
For talents, quality of life matters more and more



Changing Labour Preferences

The GTCI report notes a heightened preference for a better quality of life, shown in chart (right) as a significant move right for lifestyle scores for the same level of competitiveness. This includes components around social security, immigration laws, safety, attitudes towards migrants and minorites, women's right and other quality of life factors. This also shows up in an increasing preference of gig based work and other more temporary forms of employment. In essence, the idea that there is only one preferred path to employment may not hold true any longer.

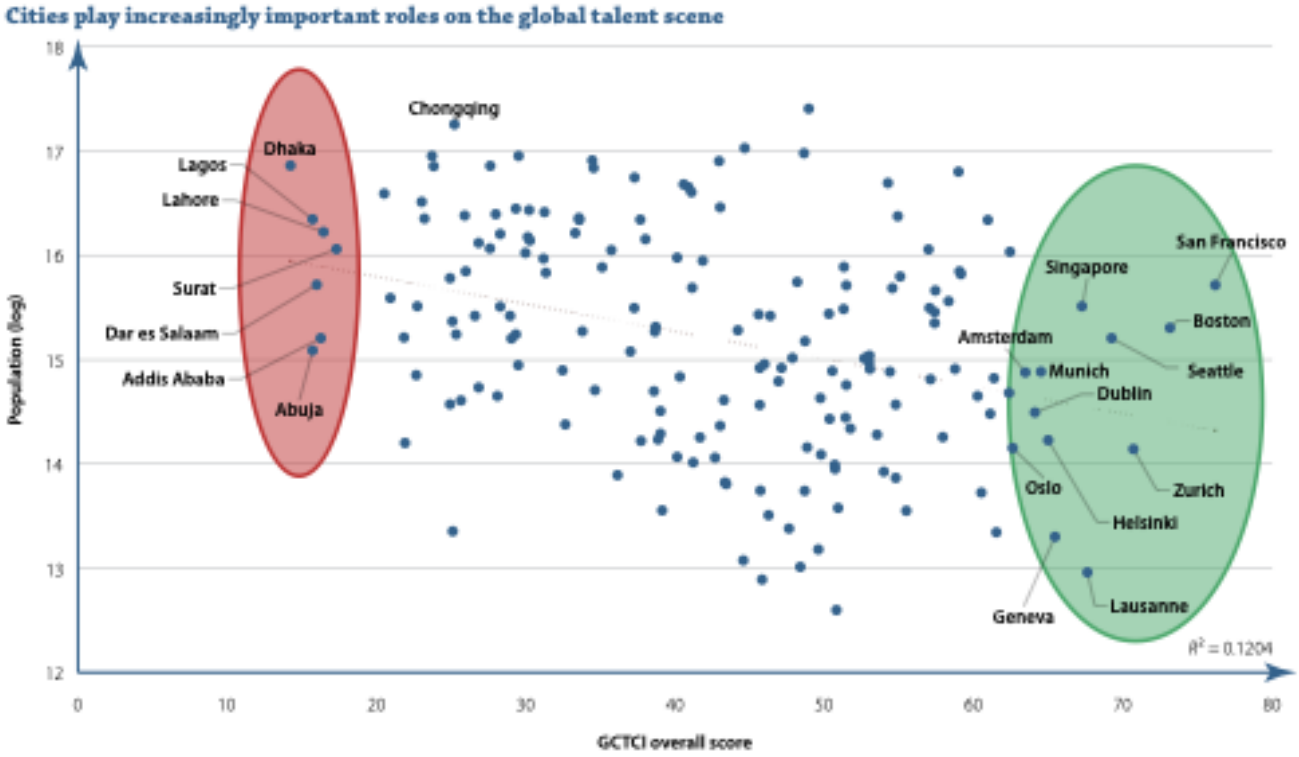


Source: Authors, based on personal communication with Ernie Tedeschi, policy economist at Evercore ISI; Akhtar (2020).

Secondly, the recovery in knowledge driven sectors (that are more amenable to remote work) has been much faster and better than other more traditional sectors. This is also borne out by the WEF 2023 job market survey which shows the increasing importance of technology to the labour market.

A third significant trend is the increasing importance of second-tier cities in the global talent race, with the report finding that smaller cities are more

likely to implement innovative talent policies. They also have the added benefit of not having to deal with large population related problems.

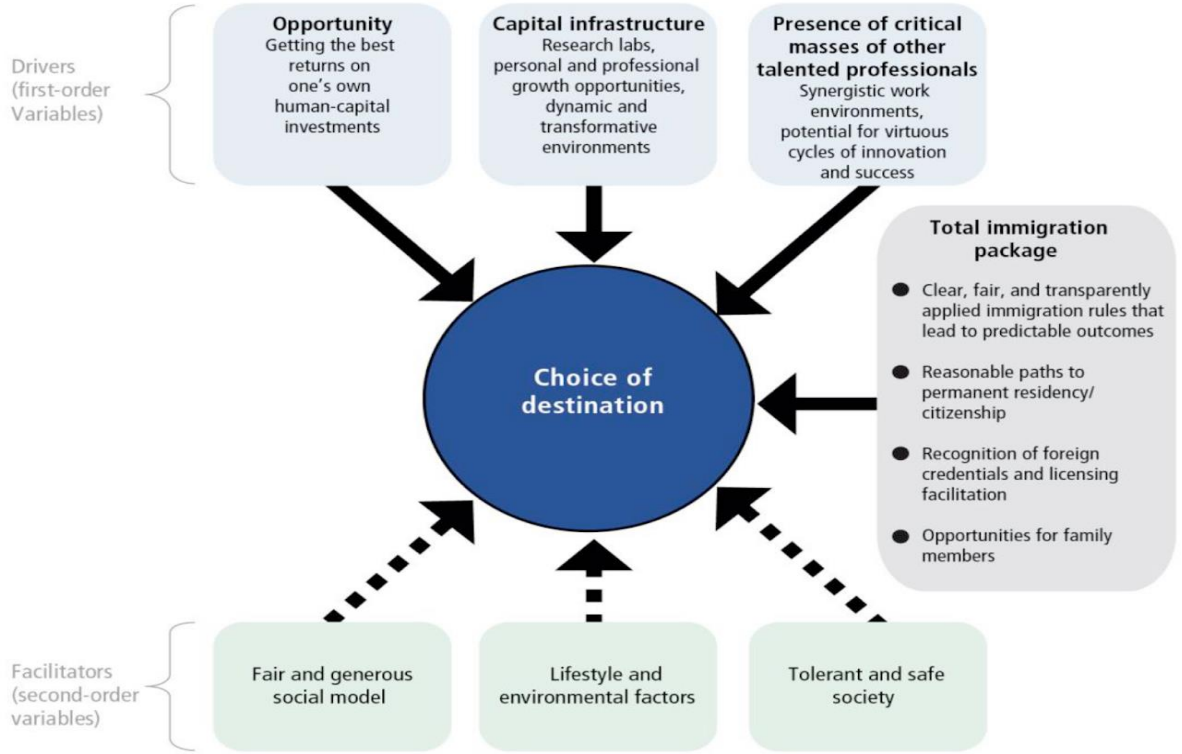


What moves talent?

The reasons for moving to different destination to live and work is usually a complex one (refugee movement excluded). The primary drivers would be the return on human capital expected by the individual, the presence of knowledge and capital infrastructure and network effects from existing talent agglomerations in cities and regions. In addition, migration choices are influenced by softer variables (facilitiators) such as the social models in place like social security, universal healthcare and unemployment facilities and quality of life factors such as personal safety, education systems, rule of law and ease of living, tolerance towards immigrants etc.

Decision-making calculus on the choice of destination

New talent has high expectations



Source: Migration Policy Institute, Talent in the 21st Century Economy, Washington, D.C., 2008, updated from Papademetriou, Somerville, and Tanaka, Washington, D.C., 2013.

Within this broad framework, what attracts global talent may differ depending on the cluster we seek to attract.

Group	Drivers
Academics/Scientists	• Reputation of institutions • Collaborative networks and ease of collaboration • Pay • Ability to apply research (industry presence)
Professionals	• Multinational firms seeking new markets • Professional networks in relevant industries • Compensation/Pay • Growth and Leadership opportunities
Students	• Reputation of institutions • Scholarships / Cost of living • Path to employment

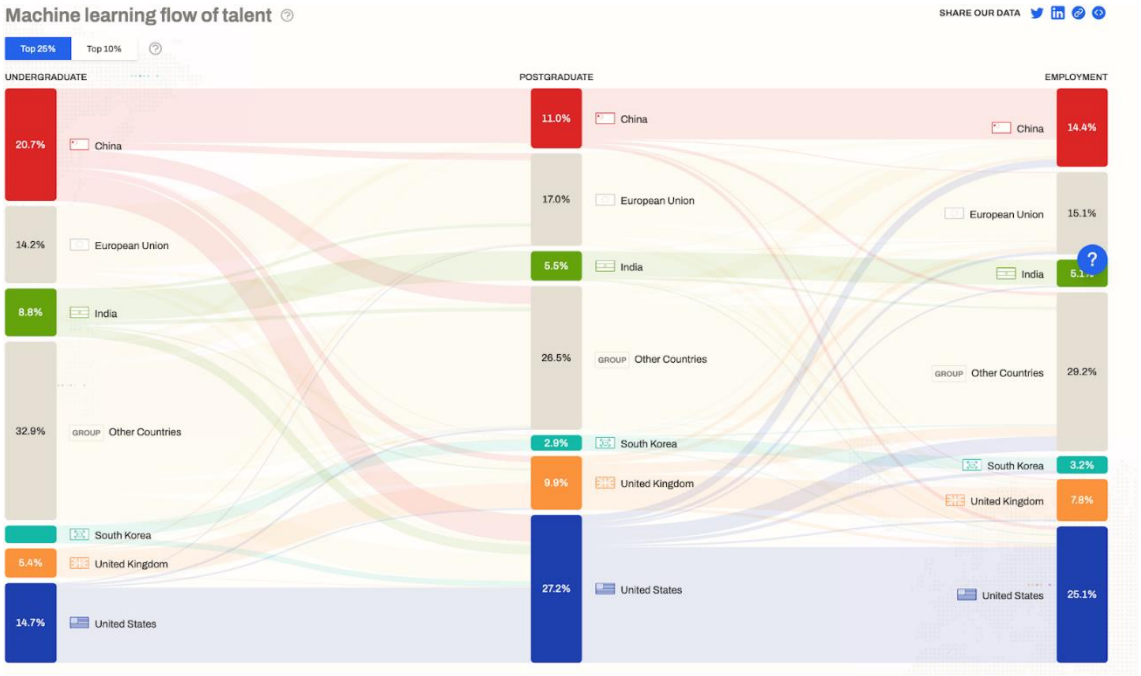
	• **Immigration Path**

Finally, immigration rules and policies play an important part in shaping the choices of potential migrants to a place. Clear and transparent policies that allow for predictable outcomes, including permanent citizenship or residency and the ability to bring in families, are key to attracting high-skilled global talent.

An under-appreciated by key aspect of attracting global talent is to consider when it happens. The Australian Strategic Policy Institutes (ASPI) critical technology tracker provides us an easy way to see talent migration trends. The sample chart below shows us two common themes:

1. The vast majority of moves happens in the postgraduate stage, this is where the U.S. attract most of its global talent and subsequently retains it

2. Global transfers of talent rarely happens at the employment stage. Most transfers appears to be people going back to their countries. Even this is relatively muted, on average countries are able to attract back about 25% of the talent lost



Concluding Remarks

The reasons for moving to different destination to live and work is usually a complex one (refugee movement excluded). The primary drivers would be the return on human capital as the world moves away from peak globalisation, we see attitudes towards immigration changing. Even in countries open to immigration, like the U.S., Singapore, and the U.K., the conversation has turned to the impact of immigrants on local talent and the need to protect local jobs. Despite this, the competition for attracting skilled global talent can only be expected to increase.

For India, the size of our economy (nearly $4 trillion) and our sustained economic growth vis-a-vis the rest of the world are our best weapons to attract global talent. India already has a large market in areas such as defence, airlines, FMCG and data. This alone will attract global professional talent to India as multinational firms seek to exploit the market. Making it easier for global firms to setup shop in India and both enter and exit relatively easily will a key aspect of attracting these firms. This will need liberalised labour laws, along with easier immigration pathways for international talent.

As we show earlier in the paper, attracting students at the tertiary education stage is among the most robust ways to attract and retain talent. Scholarship funding to attract the best international students at a post graduate, PhD level should be a key part of our innovation programs and missions. India already offers some scholarships (~ 6000 to date) to students from 180 countries through the Indian Council for Cultural Relations (ICCR). The new National Research Foundation funding also includes a few international collaborations which are open to researchers worldwide but this needs to be increased.

Ideas to consider

China as Talent Development Partner

The Economic Survey 2024 has emphasised the need for India to either integrate into China's supply chain or encourage FDI from China as a way to boost exports. To this, we would add that India should look to encourage movement of talent between both countries. Chinese universities today are world leaders in areas like machine learning and AI, quantum, material sciences etc. and we should look to create collaborative structures that enable the free movement of researchers between India and China.

Creating Talent SEZ's

Smaller cities are better at competing for talent and we should explore the idea of creating talent hubs in tier-2 cities near existing talent ecosystems. A focused SEZ like model which incentivises integrated ecosystems of educational institutions, research labs, and companies backed by more liberal labour, taxation, and FDI rules could be used to attract firms and talent.

IV. Skilling India's Human Capital for the Future: Aligning talent development with geopolitical and economic realities

Author

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Introduction

India stands at a crucial juncture in its economic development. With the world's largest youth population, the country has the potential to reap significant demographic dividends, only, however, if we align it with the emerging geopolitical and geoeconomic realities.

This research paper makes the point that we need to recognise emerging global trends, and make targeted interventions to align India's talent development with future geopolitical and geoeconomic realities. It also proposes some strategies to achieve this.

The intensifying strategic competition between the United States and China is a reality. This rivalry extends beyond traditional military and economic spheres into the realm of technology. Both nations are vying for supremacy in critical areas such as artificial intelligence, quantum computing, 5G networks, and semiconductor manufacturing. This competition is driving increased investment in research and development, but also leading to technology decoupling, with each side seeking to reduce dependence on the other's tech ecosystem.

The rise of techno-nationalism is another key factor. Technological capabilities are increasingly being seen as central to national security, economic competitiveness, and national pride. This has led to a surge in protectionist policies, export controls, and restrictions on foreign investment in tech sectors. The global semiconductor industry, for instance, has become a focal point of this trend, with nations scrambling to secure domestic chip manufacturing capabilities to reduce reliance on foreign suppliers.

Simultaneously, we're witnessing the emergence of new alliances and partnerships centred around technology, like the Quad (US, Japan, India, and Australia) and AUKUS (Australia, UK, and US). Countries are also trying to reduce their technological dependence on the US and China. The choices by the global south, which includes countries like India and Brazil, in areas like 5G infrastructure or digital payment systems can have far-reaching implications for global tech standards and norms.

Data sovereignty and cybersecurity have emerged as critical issues in this new landscape, with stricter data localisation laws and greater control over national digital domains. This trend is fragmenting the global internet and creating new challenges for nations as well as multinational tech companies.

The intersection of climate change and technology is another emerging front in geopolitics. The race for clean energy technologies, critical minerals for batteries, and climate tech solutions is becoming a new arena for global competition and cooperation.

These evolving geopolitical and geoeconomic realities are creating a more complex, fragmented, and competitive global tech landscape. They are reshaping supply chains, influencing innovation trajectories, and forcing companies and countries to rethink their strategies. As technology becomes increasingly central to national power and economic prosperity, its role in shaping global politics and economics is only set to grow, making technology geopolitics a critical area of focus for policymakers, businesses, and researchers alike. But a nation without the requisite talent ecosystem will not be able to rise to this challenge. Hence, there is the need to align talent development with emerging geopolitical and geoeconomic realities. This requires targeted interventions as against generic measures aimed at overall talent development.

Talent as a necessary condition

Singapore's experience demonstrates that talent development is a crucial precondition for technological advancement and innovation. The country's strategic focus on increasing its pool of scientists and engineers, coupled with policies to enhance research awareness among SMEs and boost enrolments in science and technology-related subjects at both polytechnic and university levels, has directly contributed to its rising research intensity and improved patenting record. This approach has created a robust foundation for innovation by ensuring a steady supply of skilled professionals capable of conducting advanced research and development projects in industrial settings. Importantly, these studies have shown that regardless of the magnitude of financial investment, the return on investment remains disappointingly low if a robust talent ecosystem is not cultivated and nurtured, emphasising the importance of prioritising skilled workforce development, particularly in science and engineering fields.

India's current skill landscape

India's workforce is characterised by a significant skills mismatch. According to the India Skills Report 2024, only 51.25% of graduates were found employable, highlighting a significant gap between education and industry requirements.

One of the most pressing issues is the gap in advanced technology skills. According to a 2023 report by NASSCOM, only about 12% of India's IT workforce is skilled in emerging technologies. In the renewable energy sector, which is critical for addressing climate change and reducing dependence on fossil fuel imports, India faces a significant skills gap. A study by the Council on Energy, Environment and Water (CEEW) found that India's renewable energy sector could create around 3.4 million jobs by 2030, but the country currently lacks a workforce with the necessary technical skills to fill these positions. Only about 40% of the required skilled workforce is estimated to be available domestically.

In the realm of cybersecurity, another area of growing geopolitical importance, India faces a severe shortage of skilled professionals. The Data Security Council of India reported in 2023 that the country needs about 1 million cybersecurity professionals, but has less than 10% of that number currently available. This gap leaves India vulnerable in an era where cyber warfare and data protection are becoming increasingly central to national security strategies.

The talent mismatch is further exacerbated by restrictions on talent migration. Tightening visa regulations in countries like the United States and the United Kingdom are making it more difficult for Indian talent to access international expertise and experience. For instance, the number of H-1B

visas (a common route for Indian tech workers to the US) approved for initial employment decreased in the last few years even before the pandemic-related restrictions.

The Government of India has been taking several steps to develop talent keeping in mind geopolitics and geoeconomics, recognising the importance of these aspects in the evolving global landscape. These include the Digital India Initiative, National Education Policy 2020, Skill India Mission, NITI Aayog's AI initiatives, programs like iDEX (Innovations for Defence Excellence), etc. However, we need more targeted interventions, at a much larger scale, and in mission-mode.

Skill gaps and future needs

In light of emerging geopolitical realities, developing talent in the following key areas is crucial for India's national security, economic competitiveness, and technological sovereignty.

1. Semiconductor Design and Manufacturing: India currently faces a shortage of 4 lakh trained professionals in the semiconductor industry.
2. AI and Machine Learning: According to NASSCOM, India will face a shortage of 14-19 lakh AI and big data analytics professionals by 2026.

3. Defence Technology: Skills in areas like cybersecurity, drone technology, and advanced materials are crucial for defence modernisation.
4. Quantum Computing: As quantum technologies advance, skills in quantum algorithms and cryptography will be in high demand.
5. Digital Literacy: Basic digital skills will be essential for nearly all jobs in the future.
6. Science, Technology, Engineering, Mathematics (STEM) Skills: Particularly in areas like data science, AI, and robotics.
7. Green Skills: Skills related to renewable energy, sustainable agriculture, and environmental management.
8. Advanced Manufacturing: Skills in areas like 3D printing, IoT, and smart manufacturing.
9. Soft Skills: Critical thinking, creativity, and adaptability will be crucial in a rapidly changing ecosystem.

Aligning skill development with global realities

While it is imperative to focus on developing talent for emerging technologies and sectors in response to shifting geopolitical and geoeconomic realities, we must not lose sight of the critical importance of primary and basic education. Without a robust basic education system, efforts to develop talent

in cutting-edge areas like artificial intelligence, quantum computing, or advanced manufacturing may falter due to a lack of adequately prepared candidates.

However, the foundational level of learning is not the aim of this research paper, and hence we are not elaborating on that. That is best left for a research paper of its own.

We are focussing here on what targeted interventions can we as a country, and the government in particular, make at a higher level to align our high-tech talent with emerging global realities, assuming that the foundation level push is going on in a parallel track of its own.
We need to identify the crucial, niche sectors, and make very targeted interventions, while at the same time recognising what are our inherent strengths and how those can be leveraged.

To bridge the skill gap and prepare for future realities, India should:

1. Enhance Semiconductor Education: Establish dedicated semiconductor design and manufacturing programs in technical institutions. Collaborate with global leaders like Taiwan's TSMC for knowledge transfer.
2. National Semiconductor Mission: Implement a comprehensive strategy to develop India's semiconductor ecosystem, including talent

development, infrastructure creation, and incentives for domestic and foreign investment.

3. Boost AI Research and Education: Increase funding for AI research in universities and establish more specialised AI programs. The Indian Institute of Technology, Madras has already launched a BSc in Programming and Data Science, which could serve as a model.
4. AI Skilling Initiative: Launch a national AI skilling program aimed at training 5 million AI professionals by 2030.
5. Strengthen Defence-Academia Partnerships: Foster collaboration between defence research organisations like DRDO and academic institutions to develop cutting-edge defence technologies.
6. Defence Innovation Hubs: Establish defence innovation hubs in major cities to foster collaboration between startups, academia, and defence organisations.
7. Invest in Quantum Education: Initiate quantum computing courses at the undergraduate and postgraduate levels. IBM's Quantum Educator program could be leveraged for this purpose.
8. Reform Education System: Integrate practical skills and emerging technologies into curricula at all levels.
9. Enhance Industry-Academia Partnerships: Encourage co-creation of curricula and increase internship opportunities.
10. Leverage Technology: Use EdTech solutions to democratise access to quality education and skills training.

11. Foster International Collaborations: Establish partnerships for knowledge exchange and mutual recognition of qualifications.
12. Focus on Reskilling and Upskilling: Develop programs for continuous learning to keep the workforce updated with evolving skill requirements.

Leverage existing strengths

India should strategically leverage its existing strengths while developing talent for the new geopolitical and geoeconomic landscape. The country's prowess in software development, exemplified by its world-renowned IT services industry, provides a solid foundation to build upon. India should use this expertise to accelerate its growth in emerging fields like artificial intelligence, machine learning, and quantum computing. India's experience in managing large-scale IT projects could be leveraged to develop comprehensive digital infrastructure projects, both domestically and internationally, enhancing its geopolitical influence. India has strengths in frugal innovation which could be applied to developing cost-effective solutions in areas like renewable energy and advanced manufacturing. Additionally, India's diverse linguistic landscape and experience in localisation services could be harnessed to develop multilingual AI systems, giving it a unique edge in the global AI market.

A few policy recommendations for India to leverage its strengths while building talent for emerging geopolitical and geoeconomic realities:

1. Establish AI and Data Science Centres of Excellence: Create specialised institutions that combine India's software expertise with advanced AI research.
2. Launch a National Digital Literacy and Upskilling Program: Implement a large-scale program to enhance digital literacy across all segments of society, leveraging India's experience in IT education.
3. Create a 'Green Technology Innovation Fund': Establish a government-and-VC-backed fund to support startups and research projects that combine India's software capabilities with green technology solutions. Focus on areas like smart grids, energy-efficient systems, and sustainable urban planning.
4. Develop a 'Global South Tech Cooperation Initiative': Leverage India's experience in providing cost-effective IT solutions to create a program that offers technological assistance and knowledge transfer to developing countries. This initiative would strengthen India's geopolitical ties, especially in Africa and South Asia, while creating opportunities for Indian tech talent abroad.
5. Implement a 'Quantum Computing and Cryptography Mission': Launch a national mission to develop quantum computing capabilities, focusing on India's strengths in theoretical computer science and cryptography.

Innovative financial mechanisms

To thrive amid emerging geopolitical and geoeconomic realities, India must develop its human capital through innovative financial mechanisms that foster talent retention and skills development. Some transformative strategies could be the following:

1. Public-Private-VC Funds: Leveraging collaboration between government bodies, private enterprises, and venture capitalists, these funds can provide robust financial support for educational initiatives, by pooling resources and sharing risks.
2. Strategic Skills Bonds: These bonds allow investors to finance students' education in critical fields. The repayment model is tied to a percentage of the students' income, activated only when they secure jobs in India. This approach not only funds education but also incentivises talent retention within the country, ensuring that the benefits of skilled labour remain domestic.
3. Corporate Talent Futures Market: In this innovative market, companies can invest in promising talent early on, funding their education in exchange for future commitments to work or a share of future earnings. This mechanism aligns the interests of corporations with the development of a skilled workforce, fostering a proactive approach to talent cultivation.

4. Lifelong Learning Vouchers: Every citizen, upon reaching the age of 18, receives a substantial learning voucher to be used over their lifetime for education, vocational training, or skills development. This system ensures continuous investment in personal growth and adaptability, crucial for navigating the dynamic job market. Alternatively, an annual stipend dedicated to education and skills training can be provided, supporting lifelong learning and upskilling.
5. Advanced Market Commitments: These commitments involve government or corporate guarantees to purchase a certain amount of a product or service once it is developed, in this case, highly skilled talent. By ensuring a market for specific skill sets, this mechanism encourages investment in targeted education and training programs, aligning workforce development with market needs.
6. Let's look at some targeted suggested interventions in the next few sections.

The Quantum Leap Initiative: a private-sector driven national skill transformation

This envisions creating a parallel, hyper-accelerated education and skill development ecosystem entirely run by the private sector, leveraging cutting-edge technology and innovative learning methods to produce world-class

talent in strategic fields at an unprecedented scale and speed. It would have the following aspects.

1. Mega Skill Cities: Establish 10 privately-owned, autonomous, self-contained "Skill Cities" across India, each focusing on a critical domain (e.g., AI, Quantum Computing, Biotech, Advanced Manufacturing). This would require funding by government, private sector and venture capitalists. We would need innovative financial mechanisms, some of which have been highlighted in this paper, to achieve this.
2. Virtual Reality Immersive Learning: Create hyper-realistic VR simulations for hands-on training in complex fields like semiconductor design, quantum algorithms, or advanced materials.
3. Reverse Brain Drain Incentives: Offer substantial equity stakes in Skill City startups to attract top Indian talent working abroad back to India.
4. Partnerships: Form deep, "entangled" partnerships with leading global tech companies, research institutions, and universities, where resources, talent, and intellectual property are shared seamlessly.

The aim of this initiative is to:

- Produce 1 million highly skilled professionals in strategic sectors annually.
- Create a big, active skill development industry within 5 years.
- Position India as the global leader in future-ready talent.

This radical approach completely reimagines education and skill development, leveraging cutting-edge technology and innovative models to create a parallel, hyper-efficient system.

National Strategic Talent Accelerator Programme (N-STAP)

The core idea of N-STAP is to create a hyper-focused, intensive talent development ecosystem that directly aligns with India's geopolitical and geoeconomic priorities. This involves establishing a Sovereign Talent Fund, funded by the government and private sector. This will also be used to create 10 world-class, sector-specific academies focused on geopolitically strategic areas like semiconductors, quantum computing, AI, etc. We could mandate industry sabbaticals for all public university professors in STEM fields. We need to establish a public-private entity called National Apprenticeship Corporation to manage a nationwide apprenticeship program. This needs to be supplemented with "Strategic Skills Bonds", where students' education in critical fields can be funded by investors with repayment tied to securing jobs. We could incentivise talent retention with this. Also, there has to be mandatory reskilling requirements for professionals working in the critical areas.

The aim of this programme is to focus talent development towards the critical, emerging sectors and invest heavily into that.

Universal National Skill Voucher (UNSV) Program

The "Universal National Skill Voucher (UNSV) Program" is an innovative and disruptive policy designed to democratise access to advanced education and skills training by providing every Indian citizen with a lifelong learning voucher. This voucher can be used to acquire new skills, pursue higher education, or undergo specialised training, with the goal of aligning India's workforce with emerging geopolitical and geoeconomic realities. This could be a one-time transfer given at the age of 18, or annual stipends starting from age 18 and continuing up to a certain age. This should have global mobility and flexibility to be truly useful. To reduce the financial outlay, we should focus on critical and emerging sectors. Employers can provide matching contributions to tie it with industrial needs.

Liberalising India's Higher Education

India's higher education sector has long been characterised by stringent regulations that, among other things, limit foreign university participation and prohibit for-profit institutions. This closed approach, while intended to protect domestic institutions and ensure quality, has inadvertently stifled innovation, limited global exposure, and restricted the growth of high-

quality educational opportunities. Liberalising this sector could bring about transformative changes in terms of quality and global standards, reduce brain drain, help in job creation and economic growth, boost innovation and research, attract foreign investment, and put competitive pressure on domestic institutions.

We suggest the following policy recommendations:

1. Allow 100% FDI in higher education through the automatic route.
2. Permit for-profit models in higher education, with appropriate regulatory oversight to ensure quality.
3. Create a streamlined, single-window clearance system for foreign universities to set up campuses.
4. Develop a flexible accreditation system that recognises diverse global education models while ensuring quality.
5. Offer tax incentives for the first 5-10 years to foreign universities setting up campuses in India.
6. Allow foreign universities to repatriate profits, subject to certain conditions like reinvestment in research or scholarships.

Conclusion

India's future economic success hinges on its ability to develop a skilled workforce aligned with global geopolitical and geoeconomic realities. We need to anticipate future needs, implement forward-looking policies, and strive to position India as a global skill hub. The path forward requires concerted efforts from government, industry, and academia. Most importantly, to achieve all this, we require targeted interventions in mission mode for talent development in identified critical sectors. It cannot be just business-as-usual measures aimed at overall, generic talent development. Since the government alone cannot fund all this, this would require innovative financial mechanisms, venture capital funding, and opening up higher education to for-profit arrangements. All of this, of course, assumes that the efforts to improve foundational learning levels go on in mission mode in a parallel track.

The Takshashila Institution is an independent centre for research and education in public policy. It is a non-partisan, non-profit organisation that advocates the values of freedom, openness, tolerance, pluralism, and responsible citizenship. It seeks to transform India through better public policies, bridging the governance gap by developing better public servants, civil society leaders, professionals, and informed citizens.

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