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Confederation of Indian Industry



INDIA: GROWTH AND JOBS IN THE NEW GLOBALIZATION

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FOREWORD

A new global economic paradigm is emerging, driven by the rapid growth in digital technologies and rising economic nationalism. The global growth environment is being reshaped by a set of changes. There is a slowdown in global trade, especially merchandise trade; domestic consumption is growing; Industry 4.0 is raising productivity and re-shaping manufacturing networks; digitally delivered services are becoming increasingly relevant to consumers and businesses; and global platforms are leading to the rise of newer business models.

This changing economic growth and development paradigm forms the backdrop against which India will need to define strategies to achieve its vision of eight percent growth over the next two to three decades. However, growth alone is insufficient. Shifting demographics will necessitate a strong focus on job creation over this period of time and specific strategies to achieve a rapid increase in job growth will be required. The China model of development is unlikely to succeed in delivering against this vision. There are new opportunities emerging that India needs to capture over the next 10 to 15 years.

In this report we describe the challenges faced by India to achieving the objective of 'growth with jobs' in the changing global environment. We identify the drivers of growth and the critical leverage points or enablers where focused policy action is necessary to unleash job-filled growth. This report also sheds light on the specific sectors where opportunities for job creation must be seized.

The purpose of this report is to serve as the starting point of a very crucial dialogue around reorienting the policy framework to deliver job-filled growth in India. It is intended to serve as a call to action to bring together all the relevant stakeholders to work towards collaborative policy action and seize the opportunities in the new paradigm of economic growth and development.

Arindam Bhattacharya
Senior Partner and Director
The Boston Consulting Group

India needs to create faster growth along with jobs to reap the benefits of the ‘demographic dividend’. While this is now well understood, a deeper understanding is required of the global economic context in which India needs to move forward. Countries that had earlier made the transition from low to medium / high income have mostly followed the model of export-led growth with a focus on large-scale manufacturing. However, recent developments, such as automation and growing protectionism in advanced economies, have fundamentally altered this scenario.

In the emerging model for growth, domestic demand and the services sector will play a larger role in driving growth. India needs to be geared towards this new paradigm by focusing on four key policy areas. Building out the digital infrastructure will be as critical as physical infrastructure. Micro entrepreneurs will have a critical role in driving growth and job creation, for whom the availability of risk and growth capital needs to be ramped up. The skilling ecosystem needs to be re-oriented towards the new kinds of jobs as they emerge. Finally, labor norms need to be updated to support the new types of workers and employers.

The trend towards the increasing use of digital technologies including manufacturing technologies, known as Industry 4.0, will have an inevitable impact on Indian industry. Heavy manufacturing sectors are likely to start shedding jobs under the impact of automation. Light manufacturing still has the potential to create jobs as labor-intensive technologies will continue to be used. New opportunities will arise in the services sector which needs to be seized by Indian industry. These opportunities will arise not only in existing sectors such as construction and financial services, but also in currently under-penetrated services such as education, tourism and healthcare. Digital services, often provided over a platform, are opening up a new model for job creation.

In this report, the Confederation of Indian Industry has worked with The Boston Consulting Group to highlight the emerging trends and how the country can prepare itself for the ‘new’ globalization. I believe that understanding the potential challenges would go a long way in helping us prepare to face them.

I would like to thank Dr. Arindam Bhattacharya for his efforts and that of his team in preparing this report.

Chandrajit Banerjee
Director General
Confederation of Indian Industry

EXECUTIVE SUMMARY

INDIA IS PREPARING ITS fifteen year vision document and seven year strategy and action plan. The destination is clear; India needs eight percent growth over the next 20 to 30 years to grow the Indian economy from a lower-middle income country to an upper-middle income country. Implicit in this aspiration is also the need to create 12-15 million jobs each year¹ if India has to reap the benefits of the ‘demographic dividend’, which should perhaps be the biggest policy imperative given the situation of growth with low job creation facing the country.

In recent years, however, very few countries have achieved such a sustained period of high growth and job creation, other than China. And in light of developments the world over that are creating a ‘new growth paradigm’ driven by the ‘new globalization’ (both described in this report), the aforementioned task is even more formidable. India faces two challenges in achieving this growth and job creation target.

- The first challenge is to adopt a set of strategies that will enable India to sustain a growth rate of eight percent or higher in the ‘new’ global economic environment, which is characterized by low to medium global growth and the absence of the ‘trade multiplier’. Historically, major global economies like China, The United States (US) and the maritime powers of the 18th century (The United Kingdom (UK), Netherlands, Spain, etc.) have all emerged as economic powers in a high growth global environment driven by growth in merchandise trade. We are now witnessing a shift in this model of globalization that shaped the economic growth models of these countries from low to medium / high income and followed the transition from agriculture to light manufacturing and rapid growth of exports, followed by development of heavy industry and then services. This model which was sought to be emulated by countries like India, and more recently Vietnam, is being fundamentally disrupted today by the twin forces of growth in digital technologies, including manufacturing technologies collectively

called Industry 4.0, and growing economic nationalism that puts a country's interest above globally agreed rules and norms. These twin forces are leading to a new and radically different model of globalization where large-scale manufacturing and global merchandise exports are losing their primacy as drivers of growth and jobs in the medium to longer term (although they will continue to be relevant). Also, the competitiveness of low cost labor advantaged countries is eroding as a result of Industry 4.0 and growing local regulation and protectionism. This reduced competitiveness of low cost labor driven plants due to Industry 4.0 is re-shaping global supply chains; moving away from large scale export oriented plants to smaller 'multi-country' plant networks. While this shift will play out over the next 10 to 15 years, it means that rapid and sustained reversal of stagnation in trade intensity is unlikely to happen unless services trade really accelerates and replaces the decline in merchandise trade. Therefore, a strategy of growth and job creation driven largely by growth of manufacturing and exports leveraging labor-cost competitiveness is unlikely to deliver the desired results. A new economic development paradigm is required.

- The second, and perhaps more serious, challenge faced by India is to ensure that the high growth rate is accompanied by high job creation. Between 2004 and 2012, when conclusive employment data is available, average annual Gross Domestic Product (GDP) growth was 8.1 percent but job growth averaged only two percent. Hence, India is witnessing high growth but low job creation. Instead of growth being driven by an increase in 'labor stock' (i.e. more jobs being created) it has been driven by 'capital deepening' which has resulted in growth in high capital-intensive sectors as opposed to labor-intensive sectors, thereby creating fewer jobs. Moreover, labor productivity improvements as a result of increased capital per worker have further depressed job creation. Going forward, high growth alone, even if achieved, cannot be relied on to create jobs; and a targeted strategy of growth together with job creation needs to be devised.

While the traditional model of globalization—and consequently the economic model of manufacturing and export-led growth—are being disrupted, a set of new opportunities are emerging from the growth of digital technologies.

- The first opportunity arises from the trend of growing 'servitization' of business. We are increasingly witnessing changing business models with growth of services consumption and trade, driven by a consumer need towards 'solutions' rather than simple product-related transactions. These value-added services or solutions also command higher margins for business. This growth in services can be seen, for example, in the rise of forward services in manufacturing, like asset performance improvement and predictive maintenance services, that leverage large scale data generated by connected devices. It can also be seen in the rise of asset-sharing models like Uber, which are beginning to disrupt traditional industries, such as automotives, which are growing by service provision rather than product sales. This growing servitization is

already being reflected in the changing consumption patterns of countries like India and China, and in global trade. In India, the services sector has shown immense promise with a Compound Annual Growth Rate (CAGR) of 8.6 percent (2010-2014), outperforming others such as China (8.4 percent) and the US (1.8 percent). Trade statistics show that the global growth in services trade is outpacing merchandise trade, with digital-enabled services growing the fastest. Pre crisis, the services export CAGR of India was the fastest amongst the top service producer countries, at 30.1 percent. Post crisis, with the slowdown in trade, India remains amongst the top three countries, registering a growth of 7.5 percent². Servitization opens up a whole new set of opportunities for growth and job creation, as discussed in subsequent sections. This is true of newer sectors such as digital services and data analytics (catering to global demand), as well as the more traditional service economy of transport and storage, hospitality etc. (catering largely to local demand).

- The second, related, opportunity is the growth in platform players which is driving the growth and viability of new start-ups, individual entrepreneurs, micro entrepreneurs employing a few workers, self-contracted workers etc. (collectively referred to as 'micro entrepreneurs'³ in this report). These platforms provide the necessary ecosystem for micro entrepreneurs to operate in; they eliminate the traditional need for small businesses to invest in full-scale supply chains to become competitive; and allow micro entrepreneurs to operate by providing access to suppliers, customers and the necessary infrastructure (payments, logistics, etc.). Hence, they support an entire ecosystem of self-employment; of 'job creators', rather than only 'job seekers'. By aggregating across micro entrepreneurs, platforms provide these services at relatively low transaction fees and can dramatically lower the cost of service to customers, and in turn grow the market. Micro entrepreneurs no longer need large-scale business volumes in order to operate profitably. This growth in platform players, which is made possible by technology and their customizable, scalable, asset-light models, is opening up a new path for economic growth and newer models of job creation.

The global and local challenges to growth and jobs on one hand, and the new opportunities presented by servitization and the growth in platform players enabled by newer digital technologies on the other, strongly point to the need for a new economic development paradigm for India around three pillars:

- **Domestic demand** will have to be the primary driver of growth (although exports, especially in services, will continue to contribute to GDP growth).
- **Services** will provide a strong opportunity for both domestic and export growth; even more so for job creation as manufacturing will become increasingly capital- or automation-intensive.
- **Micro entrepreneurs** will play a bigger role in driving growth and job creation, alongside larger enterprises.

The Indian Government has already launched major policy initiatives, such as Ease of Doing Business, Digital India, and Startup India, to lay a strong foundation for this new economic development paradigm. What is needed is a concerted, focused implementation of these policies as well as a special focus on ‘activating’ four key leverage points, described below, which are critical to the success of the new paradigm of growth and jobs.

1. **Digital infrastructure** will be as critical as physical infrastructure. This should cover all layers of the ‘technology stack’ (described in detail in the report)—high quality and ubiquitous broadband and low cost smart phones, the India stack, societal platforms, and standards and norms for interoperability of digital systems that enterprises can leverage.
2. **Risk and growth capital** for micro entrepreneurs has to be scaled up rapidly, along with the rules and mechanisms for easy access to them.
3. **The learning and skilling ecosystem** has to move towards a ‘life-long learning system’ as new kinds of jobs emerge with very different skill profiles. This will ensure that the appropriate skills are provided to enable employment in the new development paradigm and there is a continuous mechanism in place to update these skills as required.
4. **Labor norms** need to be revisited to ensure that they also cater to and support the new types of workers and their employers who will drive growth in this new paradigm.

The new economic development paradigm provides a set of clear policy prerogatives to drive growth and job creation. It would be helpful to identify where these jobs are expected to be created and therefore where a set of strategic policy initiatives are required.

- Industry 4.0 is expected to increase productivity significantly and alter the job creation potential of the manufacturing sector over the medium term. However, the impact is different across the light and heavy manufacturing sectors. While heavy manufacturing sectors are likely to start shedding jobs as facilities become increasingly automated, in the short term the light manufacturing sector in India has the potential to grow and create more jobs by taking advantage of the industry shifts away from China, where labor costs are rising rapidly. Furthermore, the nature of jobs that will be created will be very different in order to leverage the complementarity between labor and technology.
- The gap in employment created due to the fall in manufacturing employment will need—and has the potential to be—met by the services sector. The services sectors can broadly be categorized into three buckets, with growth and job creation potential varying across them. ‘Evolved’ services like construction and financial services are currently contributing over five percent of GDP and a large number of jobs. They will continue to grow and drive a sizeable share of job creation; however incremental job creation

(over current levels) is likely to be low. ‘Under-penetrated’ services, such as education, tourism, transport and storage and healthcare will see rapid growth and job creation, fuelled by the growth in technology. Finally, a new set of ‘emerging’ services sectors, such as natural infrastructure management and digital services, will need to be developed in order to bridge the jobs gap.

It is important to mention here that this report does not recommend de-emphasizing the focus on exports, light manufacturing, physical infrastructure creation etc.; these have been the traditional policy levers for growth, and strategies to boost them are widely discussed and understood. Coordinated strategies to increase India’s share of exports (trade facilitation, branding and marketing, foreign direct investment (FDI) promotion, etc.) should continue to be implemented, especially in light manufacturing sectors where the opportunity is ripe. Further, construction has generated significant growth and jobs and is likely to continue to do so, based on the current trajectory. The report also does not discuss the pillar of ‘growing local demand’ as the Government has initiated various policies and taken steps towards the same. This report does, however, strongly recommend adding ‘new arrows’, which are becoming more critical in the new globalization, to the scabbard of policy making. This report was written in order to reorient the growth and jobs dialogue by bringing together the global and local context in which India will have to drive growth and job creation over the next two to three decades. It will provide a view on how it can achieve the desired number and types of jobs that need to be created. It is best read in conjunction with the 'Future of Jobs in India—Enterprises and Livelihoods' report by the Confederation of Indian Industry (CII), written in association with The Boston Consulting Group (BCG), with the participation of the Department of Industrial Policy and Promotion (DIPP).

The remainder of this report is structured as follows: The first section discusses the global and local challenges to growth with jobs. The next section delves into the key drivers of growth and job creation in the new paradigm of development. This is followed by an explanation of the four critical leverage points that need to be activated to ensure growth and jobs and the policy imperatives to drive their development. The final section highlights the sectors where a strong strategic focus and policy action can bridge the gap between jobs needed and jobs being created. The appendix to this report highlights the impact of Industry 4.0 on employment, across countries and sectors, based on research conducted by various organizations.

NOTES

1. Over the next five years, and potentially a lot more thereafter as the share of the working-age population increases.
2. Economic Survey of India, 2016-17.
3. In the future of work, there are a range of new job types emerging such as professional tribers who assemble freelancers into short-term project teams, connectivity advisors who may be micro entrepreneurs, drivers connected to aggregators who are self-contracted, etc.

GLOBAL AND LOCAL CHALLENGES TO GROWTH WITH JOBS

INDIA IS ONE OF the fastest growing economies in the world. Over the last five years, it has posted an average annual GDP growth of approximately 6.7 percent against the global average of 2.7 percent. Between 2004 and 2012, when conclusive employment data is available, average annual GDP growth was 8.1 percent but job growth averaged only two percent. India's employment problem is further complicated by its demographic situation; it is at the cusp of realizing its demographic dividend. Approximately half of India's 1.2 billion people are under the age of 26; by 2020, India is forecasted to be the youngest country in the world with a median age of 29. United Nations Development Program (UNDP) estimates that 2040 will be the year when India will have the maximum share of working-age population; and in 2050 it will have the maximum number of working-age people. This significant growth in the working-age population further underscores the need to create jobs.

The magnitude of the problem can be explained as follows. Every year, 5-7 million young people join the workforce in India. Meanwhile, five million people leave agriculture to join the non-agriculture sectors and 2-3 million educated, unemployed people look for jobs in the industry and services sectors. This is assuming that it takes five years for the presently 10 million unemployed people to find employment. Hence, we estimate a total

annual demand of 12-15 million non-agriculture jobs per annum. Against this, only about 8 million jobs were added in these sectors every year from 2004-2005 to 2011-2012¹. Hence, there is a gap of 4-7 million jobs that needs to be addressed, which is likely to increase due to the growing number of young people entering the labor force. Given that employment generation per unit of economic growth in India is two-thirds that of the global average, and recognizing the historic decline in the elasticity of job creation, estimates suggest that we will need a growth rate well above the 8 percent target in order to generate these jobs under the current growth and job creation paradigm².

In the current growth and job creation paradigm, India will be unlikely to deliver the required rates of growth and job creation for two reasons. First, the growth in digitalization and global geo-political and geo-economic shifts are fundamentally changing the nature of drivers of growth and globalization. Pre-existing models of growth and job creation, developed to succeed in the erstwhile phase of globalization, will not have the intended impact under the new framework. Second, the current pattern of growth and investment is unlikely to translate automatically into the required number of jobs due to labor productivity improvements and capital-driven growth. Strategies for growth need also to ensure job creation for the millions of youth

joining the labor force over the next two to three decades. These challenges are explored in depth in this section.

The Global Challenge to Economic Development

We are currently operating in a low to medium growth environment. Global GDP growth has averaged 2.7 percent over the past five years against an average of 3.4 percent in the decade preceding the financial crisis. India has a formidable task ahead to achieve a growth rate of 8 percent or higher in this low to medium global growth environment; even the fastest growing economies like China are expected to slow down to an average growth rate of roughly six percent over the medium term. Underlying the slowdown in global growth is a change in the economic development paradigm of manufacturing and merchandise trade-led growth.

THE 'OLD' GLOBALIZATION PARADIGM IS CHANGING

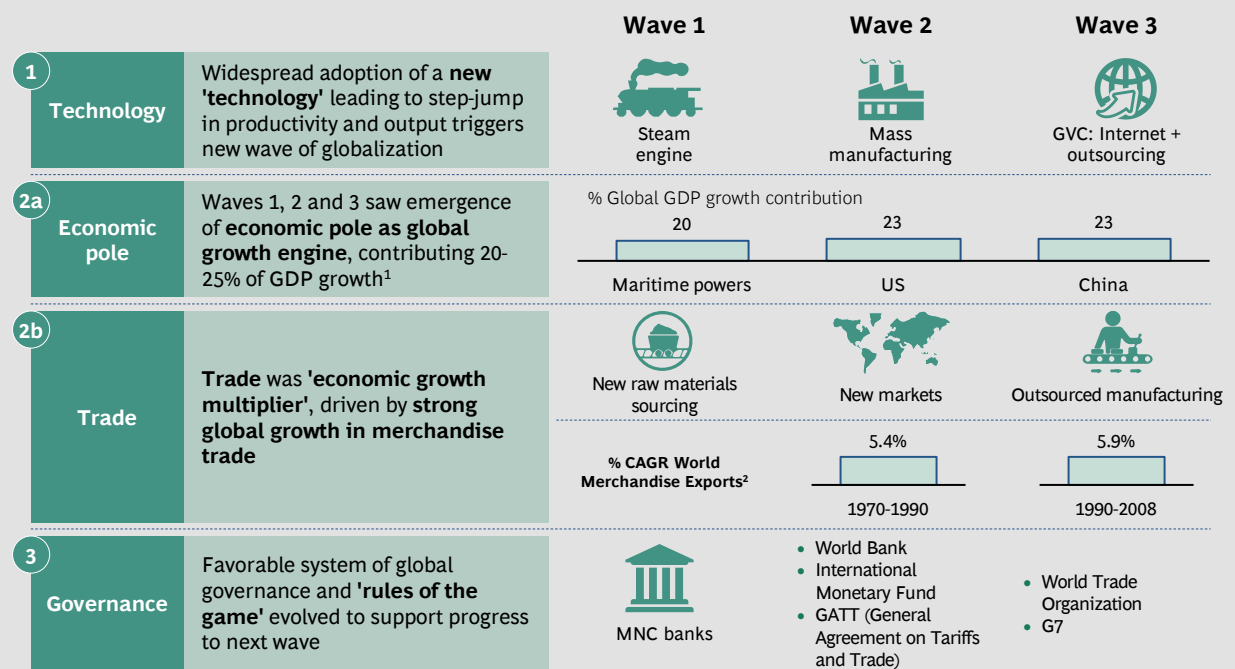
Over the last 100 years, the Ricardian model of comparative advantage and trade led to rapid growth in GDP, and consequently the

rise of 'superpowers' such as the UK in the late 1800s, the US in the 1960s and more recently, China. Exhibit 1.1 summarizes the 'old' model of globalization which supported the economic development paradigm of merchandise trade-led growth. It shows the three historic waves of globalization.

The traditional model of globalization was driven by the interplay of three forces—technology, economy and governance:

- A new 'technology' would be developed and leveraged by a country or a set of countries to boost productivity and output. In the first phase of globalization in the late 1800s it was the steam engine; this was followed by mass manufacturing and export-led growth in the 1950s and 1960s; and finally the setting up of global value chains enabled by the Internet and real-time connectivity in the 1990s.
- This new technology led to strong global growth which was driven by a global economic 'pole'. This was a country or group of countries that contributed 20-25

EXHIBIT 1.1 | The 'Old' Model of Globalization; Interplay of Technology, Economy and Governance



Sources: Angus Maddison, Penn world Tables, UNCTAD, BCG analysis.
¹PPP adjusted.
²Current US\$ values deflated by World GDP deflator to convert to 2010 US\$.

percent to global GDP growth primarily through the strong multiplier effect of merchandise trade. In the first wave, the rise of the steam engine and the industrial revolution led to the growth of the maritime powers, led by the UK. These countries imported raw materials from their colonies to manufacture cheaper products, and drove growth through manufacturing and trade. In the second wave, the development of mass manufacturing and global supply chains enabled the US to emerge as the global growth engine, whereby mass manufactured goods were then exported to new markets. Finally, the third wave saw the development of global value chains facilitated by instantaneous communication via the Internet which enabled the rise of China as a manufacturing superpower and producer for the world.

- This framework of trade and growth was facilitated by a favorable system of global governance. It enabled smooth cross-border financial flows and trade through the enforcement of stable, accepted ‘rules of the game’.

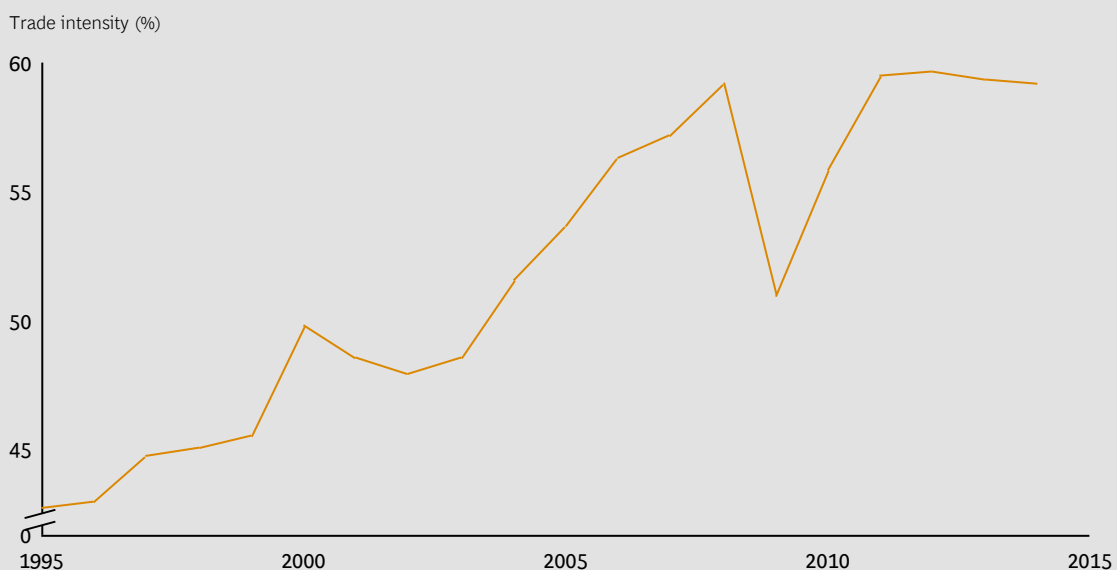
Since the financial crisis, we have witnessed a slowdown in these metrics of global trade and exchange. Trade intensity, which is a measure of the total global imports and exports as a share of global GDP, grew rapidly by close to 10 percentage points between 2000 and 2008. It has declined by 0.1 percentage point since then. This is primarily driven by the slowing down of merchandise trade, which is unlikely to reverse itself as discussed later. Furthermore, we see a sharp decline in FDI as a share of total investments despite an increase in global investment, implying that cross-border financial flows are giving way to increased domestic investment³. The slowdown in global trade has been illustrated in Exhibit 1.2 below.

These patterns are likely to continue as a result of significant shifts in two key forces of globalization—technology and governance—which will lead to a radically different model of globalization.

THE ‘NEW’ MODEL OF GLOBALIZATION AND ITS IMPLICATIONS FOR INDIA

We are seeing the start of a model of globalization that is fundamentally different from

EXHIBIT 1.2 | Global Trade is Slowing Down



Sources: UNCTAD, World Bank, BCG analysis.

Note: All figures in constant 2010 \$; Trade Intensity is measure of the total global imports and exports of goods and services as a share of global GDP.

the previous wave. Under this model, we will be in a scenario of low to medium global growth; lower physical exchange of goods; and growing global divergence on economic matters due to the predominance of geopolitical concerns. This new model is a function of two factors: growth of digital technologies and growing protectionism and country-centrism. Both of these factors have implications for the development model of countries like India.

First, in the new wave of globalization, we are seeing growth in the adoption of newer digital technologies (collectively referred to as Industry 4.0). These technologies are leading to greater automation in manufacturing, the growth of digital service offerings and the rise of platforms that are transforming the traditional way of doing business. Industry 4.0 is fundamentally altering the cost economics of manufacturing and competitiveness of countries. The output per worker is projected to increase by as much as 30 percent and labor cost savings are likely to range from 20 percent to 30 percent in some of the more advanced manufacturing economies⁴. The appendix to this report provides further details on the impact of Industry 4.0 on work, across countries and across sectors. The fall in robotics costs is resulting in faster adoption of these technologies across emerging as well as developed economies. Further, flexibility of automated manufacturing is increasing, enabling mass customization at no incremental cost without the need for large-scale labor-intensive facilities. This is resulting in the erosion of the advantage held by India and other labor-intensive manufacturing economies like Vietnam due to their large pool of low-cost labor. The changed economics of manufacturing, together with the rising total cost of operations due to significantly higher logistics, inventory and associated costs is also eroding the advantage hitherto enjoyed by large-scale plants in low labor-cost countries, making smaller plants that are closer to the market more competitive. For example, Adidas recently announced that it was bringing back some of its production to Germany from China as advances in robotics made the move cost-effective. The company is also planning to build smaller plants in its major markets over the medium term to reduce lengthy ship-

ping times and ensure faster delivery to customers. It is likely that other global, Multinational Corporations (MNCs) will follow suit in the future for new or replacement capacity; building smaller, more flexible plants closer to markets as opposed to a large-scale facility in one country. As more businesses find it cost-effective to have distributed manufacturing networks, we will see lower physical movement of goods around the world; this will drastically reduce the potential for country growth driven by the China strategy of export-led manufacturing.

Second, we are seeing a shift whereby politics now dominates economic considerations. There is growing protectionism across both developed and emerging markets. Global Trade Alert reports that more than 500 discriminatory measures were introduced globally in 2015 as against only 300 liberalizing measures. The global trade regime dominated by The World Trade Organization (WTO) is also giving way to more regional and bilateral agreements. In 1995, there were only 50 active regional trade measures; this number increased to almost 300 in 2016. Governments are increasingly seeking out more benefits in-country, such as value addition, rather than simply being content as a cog in the global supply chain. As a result of the clamor for more jobs and more growth in-country, the erstwhile manufacturing model of low-cost exports that provided cheaper goods across countries will likely evolve to a more distributed manufacturing model as described above.

Together, these two forces signal a shift in the paradigm of growth and development. Countries like India cannot rely solely on the promise of cheap labor to gain a share of the global manufacturing pie; nor can they leverage the China model to see significantly higher rates of growth.

However, this rise in digital technologies that is fundamentally altering the growth and development paradigm presents two opportunities: growth through services; and growth through micro entrepreneurs. These are described in more detail in the next section. Nevertheless, strategies for growth will not automatically generate jobs as seen over the

past several decades; a concerted policy effort to facilitate job creation is required. The next sub-section discusses the challenges to job creation in India.

The Local Challenge to Growth with Jobs

As discussed previously, India’s rate of job creation has been dismally low over the last several years. In order to plug the employment gap, we need a targeted approach to growth and job creation. There are two reasons for this situation of growth with low job creation in India.

First, growth over the last two decades has been driven by capital investment rather than labor addition. This has resulted in an increase in the amount of capital available per worker, or ‘capital deepening’, leading to an increase in labor productivity rather than in the number of jobs. Exhibit 1.3 shows the analysis of GDP growth in India between 1991 and 2014, driven by three factors—contribution of capital; contribution of labor (both quantity and quality); and total factor produc-

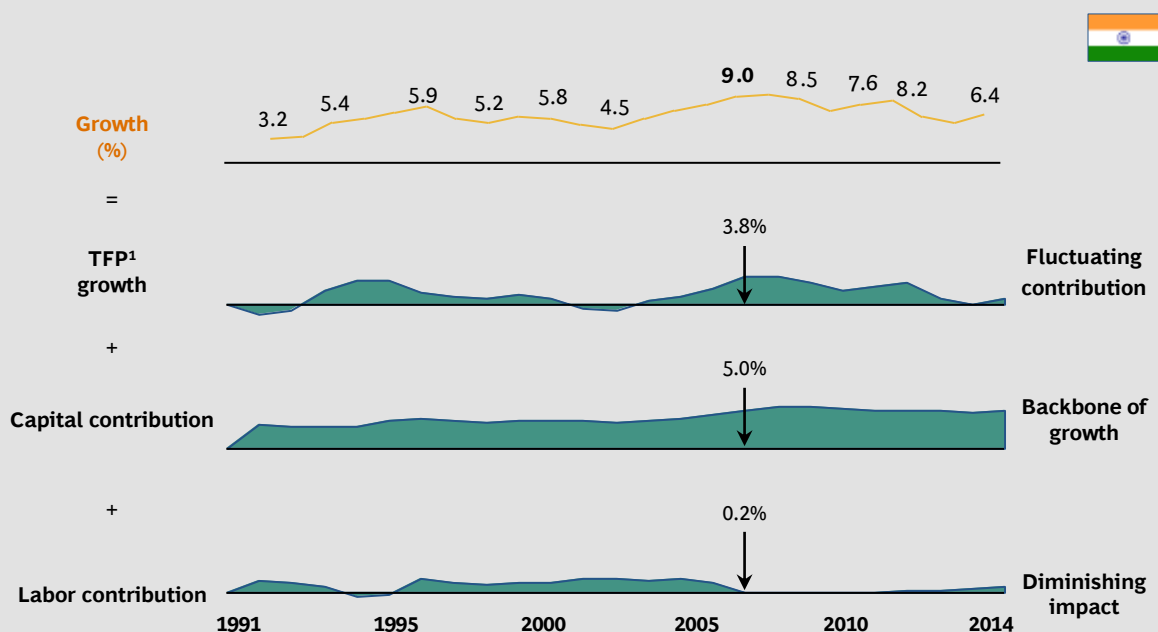
tivity (which accounts for the technology improvements that drive the overall efficiency of both labor and capital). For example, in the year 2006, GDP growth was nine percent. When we break this up into its factors, we find that 3.8 percent of India’s growth was due to total factor productivity increases (adoption of new technologies), five percent was due to capital contribution and only 0.2 percent was the labor contribution to growth.

As we study this through the years, the following observations can be made:

- Total factor productivity has had a fluctuating contribution to GDP growth, rising and falling over this period.
- Capital addition has been the backbone of growth, consistently contributing to GDP growth.
- Labor contribution to growth has been low to negligible over this period.

Therefore, India’s growth has been driven by capital deepening (or more capital investment

EXHIBIT 1.3 | Growth in India Historically Driven by Capital Deepening Not Job Creation



Sources: The Conference Board; BCG Center for Macroeconomics analysis.

Note: Graphs illustrate 2-year moving averages.

¹Total factor productivity. Equivalent to TFP contribution following the production function $\Delta \ln \text{GDP} = \bar{v} \Delta \ln K + \bar{v} \Delta \ln L + \Delta \ln \text{TFP}$.

driving higher capital per worker) with the consequent increase in labor productivity, likely due to past underemployment of labor. This model of growth led by capital deepening has prevailed across other countries in recent years as well. As seen in Exhibit 1.4 below, China's growth story has largely been the result of capital investments into the economy, with labor addition declining post 1990. Similarly, in the US, labor did not play a significant role in growth until its revival from the recent economic crisis, where capital flows probably slowed down.

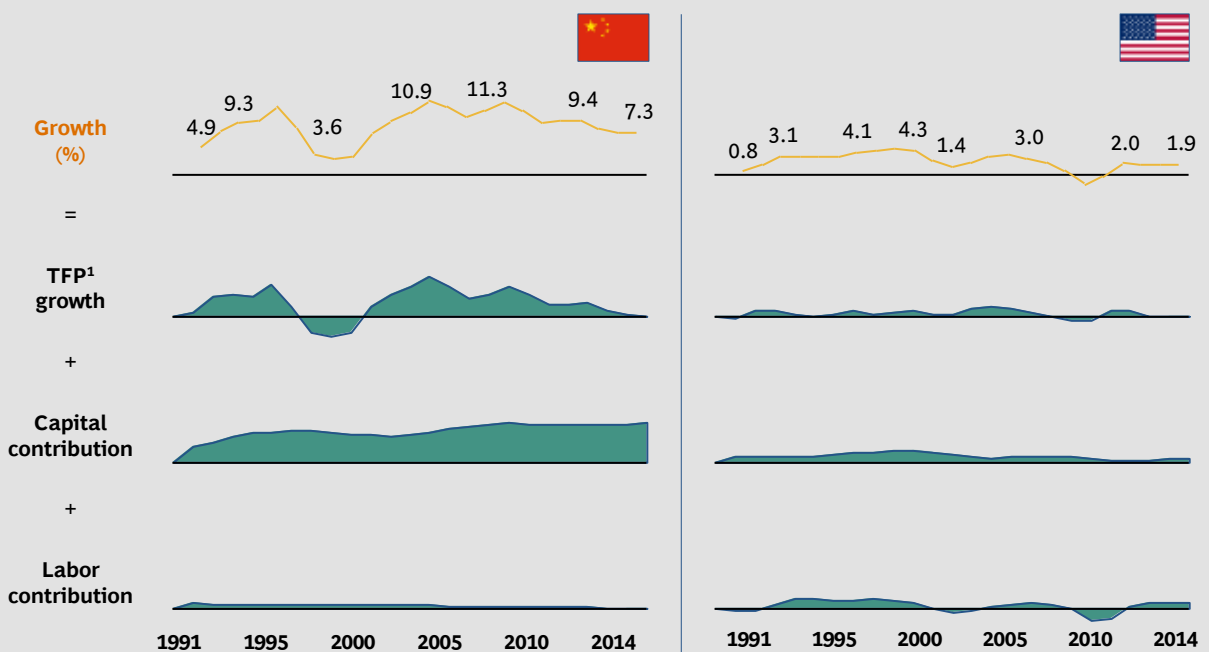
The second, and related, reason for low job creation is that the highest growth in Gross Value Added (GVA) has been in industries that are less labor-intensive, across both manufacturing and services. Exhibit 1.5 compares the growth in different organized manufacturing sectors by their labor intensity. The Y axis shows the labor intensity, measured as the number of workers per unit of GVA, and the X axis shows the total growth in value added. It is evident that while the low labor-intensive sectors like automotive, basic metals and chemicals have recorded high growth in GVA

in this period, the sectors with high labor intensity like apparel, leather and tobacco have seen low growth.

Similarly, Exhibit 1.6 shows the same pattern for the services sectors. Financial services, a low labor-intensive sector, has seen very high growth; whereas labor-intensive sectors like accommodation and catering, education and healthcare have seen lower growth in GVA.

The less than expected growth in jobs in India is a result of strong labor productivity improvements across all sectors and growth in more capital-intensive sectors. The expected employment in 2011-2012 (assuming the same employment to GDP ratio as in 1999-2000) should have been 752 million. This would have been an increase of 355 million jobs over the existing 397 million. However, as can be seen in Exhibit 1.7, actual employment created in this period was only 75 million, resulting in total employment of 472 million. This gap of 280 million jobs is the result of existing labor becoming more productive and contributing an increasing amount per worker to GDP.

EXHIBIT 1.4 | Growth Analysis of US and China Reveals Low Labor Contribution

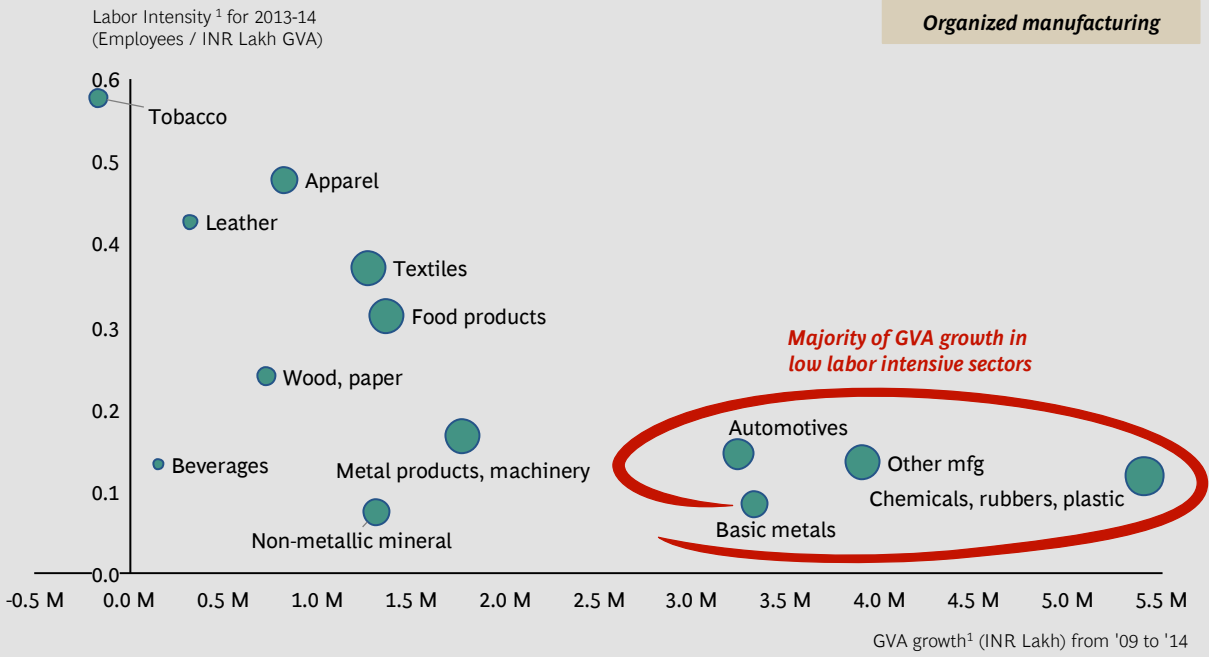


Sources: The Conference Board; BCG Center for Macroeconomics analysis.

Note: Graphs illustrate 2-year moving averages.

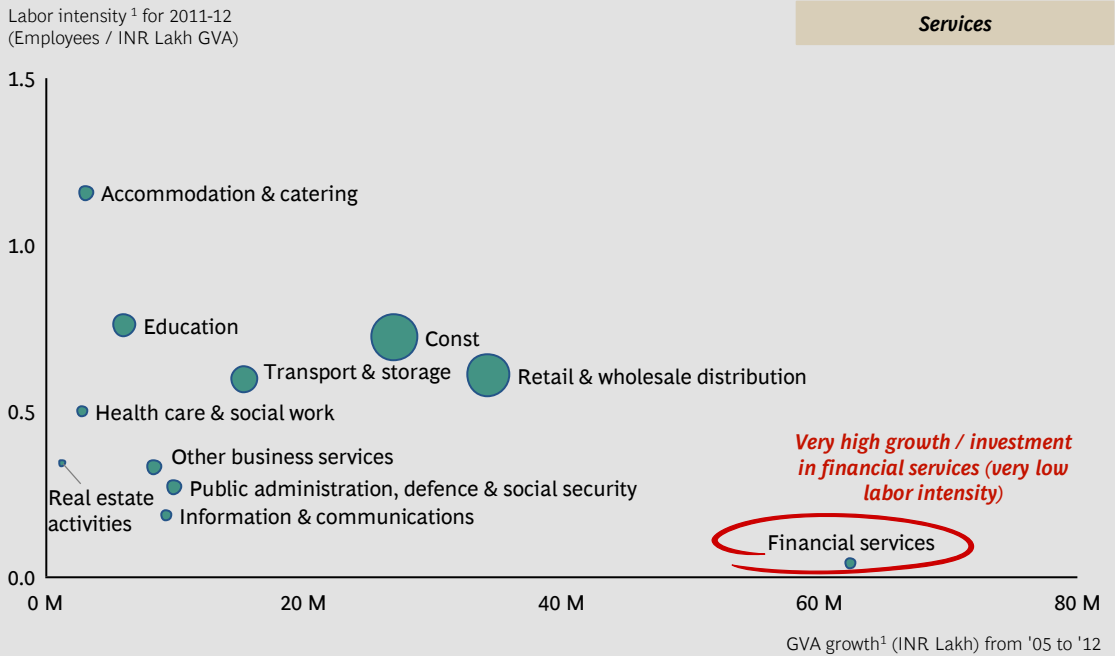
¹Total factor productivity. Equivalent to TFP contribution following the production function $\Delta \ln \text{GDP} = \bar{v}K \Delta \ln K + \bar{v}L \Delta \ln L + \Delta \ln \text{TFP}$.

EXHIBIT 1.5 | Growth in Value Added has been Higher in Low Labor-intensive Sectors



Sources: ASI data (coverage restricted to the units covered by Annual Survey of Industries); WPI inflation data; BCG analysis.
¹At 2008-09 prices.

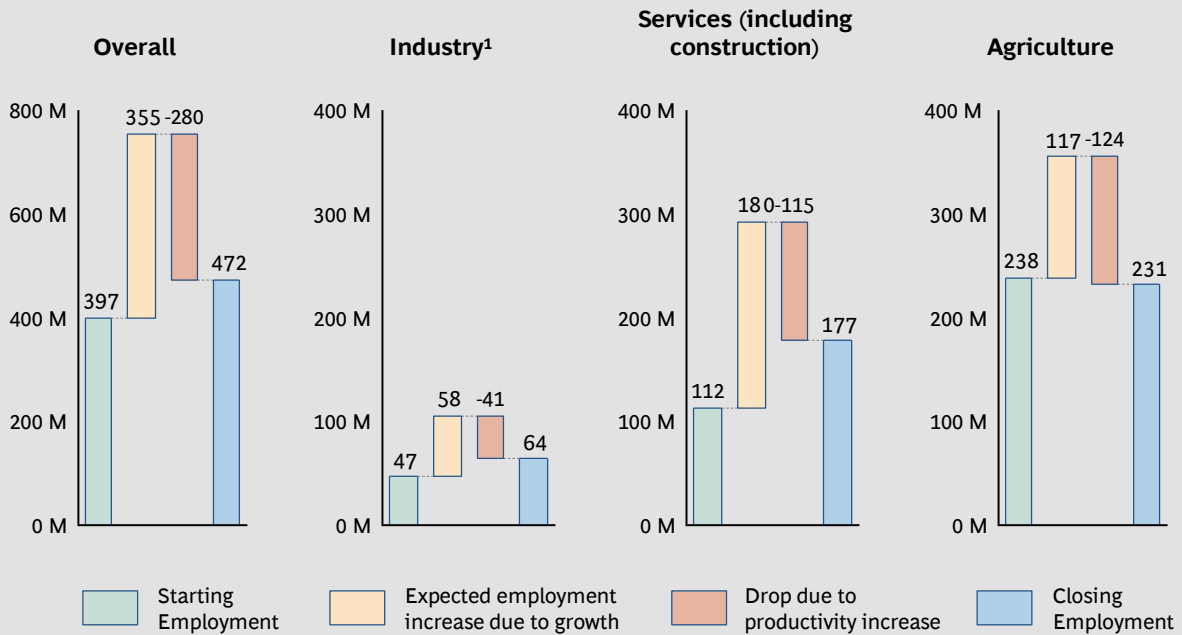
EXHIBIT 1.6 | Growth in Value Added has been Higher in Low Labor-intensive Sectors



Sources: NSSO survey; Planning Commission data; Oxford Economics; BCG analysis.
¹At 2010 prices.

EXHIBIT 1.7 | Less Than Expected Job Creation due to Rise in Labor Productivity

Between
1999-00 to 2011-12



Sources: NSSO surveys; Planning Commission estimates; BCG analysis.
¹Industry includes extraction and utilities.

In order to ensure that GDP growth creates jobs, we need to invest significantly more resources to create new jobs rather than simply make existing labor more productive. Additionally, we need to take a sector-specific approach to job creation and provide a concerted push in a set of sectors that have high job potential, as discussed in the subsequent sections.

NOTES

- 'Explaining Employment Trends in the Indian Economy', Mehrotra, S. et al, Economic and Political Weekly, 2014. The original projections state that 10 million people will join the labor force; however revised estimates suggest this is 5-7 million. We have used this revised estimate.
- 'Future of Jobs in India- Enterprises and Livelihoods', CII, 2016.
- It is important to note that if profits earned by foreign companies are reinvested in local markets as opposed to being extracted back to home markets or reinvested elsewhere, we will see a decline in the FDI metric. However, even if this is the case, the conclusion of lower cross-border flows which is an indicator of shrinking global exchange will continue to hold true.
- 'The Robotics Revolution', BCG, 2015.

GROWTH AND JOB CREATION IN THE NEW PARADIGM

AS EXPLAINED IN THE previous section, the global and local growth and jobs ecosystem faces many challenges as a result of growing digitalization and changes in global governance. While the growth in digital technologies is resulting in an end to the old paradigm of growth and development, it also provides a set of new opportunities. Digital technologies can lead to the growth of service businesses which tend to be labor-intensive and can drive growth and job creation. Digital technologies are also shaping a new 'platform ecosystem' whereby more micro entrepreneurs can actively participate in and drive growth, leading to more direct job creation. We describe both these in further detail in this section. It is useful to reiterate that the objective of this report is not to refute the importance of sectors like construction of physical infrastructure and associated services or light manufacturing for job creation. However, the new paradigm has to look beyond these traditional avenues of growth and development in order to ensure sufficient employment generation in the new globalization.

Servitization and the Platform Ecosystem: The New Paradigm

SERVITIZATION OF BUSINESS DRIVING SERVICES GROWTH AND TRADE

In the new phase of globalization, Industry 4.0 is resulting in greater integration across prod-

ucts and services and the opportunity for more services-driven growth. An example of this is the growth in the Internet of Things (IoT), which the National Association of Software and Services Companies (NASSCOM) projects will be US\$15 billion by 2020 in India, and is spawning a whole new set of digital services such as asset management services, preventive maintenance services, etc. Many global companies are committed to building digital services businesses; General Electric (GE), for example, has launched 'Predix', an industrial analytics platform which improves asset performance and optimizes operations, and is open source across manufacturers.

These services are becoming growth and profit drivers for manufacturing companies; industrial companies are capturing as much as two to five times greater value from services as compared to manufactured products. This servitization of business has a visible impact on financial performance and the economy, although macro economic indicators have a longer lag. The global export of services in general, and digital services, in particular, has grown much faster than the export of manufactured goods since 2011. In India, contribution of services to domestic consumption has almost doubled in the last 25 years and is likely to continue increasing as services begin to command a greater share of the household budget. This will be true not only for digitally delivered services but also physical services.

NEWER PLATFORMS PROPEL MICRO ENTREPRENEURS

Newer digital technologies facilitate the development of platforms that catalyze growth and globalization in the current context. These platforms are of many types: there are e-commerce platforms that enable businesses to reach customers more easily or find the right suppliers; there are aggregators that can build a marketplace by matching demand and supply, for example in the shared auto space or the hospitality and hotels space, to name a few, and so on. The emergence of platforms has led to two changes. First, they make smaller businesses viable. Before the emergence of this platform ecosystem, businesses needed to be at a certain scale and invest in a set of assets in order to benefit from lower costs and become profitable. The benefit provided by platforms is that they eliminate this need for scale, allowing small businesses to operate profitably by providing a set of services that can be outsourced without large-scale investments. The second change is that platforms have facilitated the growth of the ‘on-demand’ economy and empowered micro entrepreneurs to participate more fully in the economy, thereby driving growth and job creation. For example, Uber now enlists 2,50,000 drivers across India, many of whom were previously either underemployed due to poor customer access or unable to find jobs in this sector. The growth in platforms is leading to a new set of workers who are facilitated by them and in a contractual agreement with them, yet are ‘self-employed’. Digitalization and platforms are hence changing the ‘way of work’, and enabling individuals to become job creators as opposed to job seekers.¹

These opportunities are leading to a paradigm of growth and job creation that is very different from the classic development model of manufacturing-led export-driven growth in an ecosystem where enterprises needed to be large to be successful. While opportunities for growth and jobs in manufacturing continue to exist (as discussed in a later section), there is a new paradigm emerging that can enable India to achieve its ambitious vision. This paradigm has three pillars:

- **Services** will provide a strong opportunity for growth and job creation. These

services will include both traditional services such as construction, and transport and storage; as well as newer services such as natural infrastructure management and digital services.

- **Micro entrepreneurs** will no longer need to scale up in order to be competitive as a result of the opportunities provided by digital technologies and the platform ecosystem. Furthermore, individuals can now compete more easily, thereby driving more direct job creation and self-employment.
- **Domestic demand** will be a critical driver of growth and job creation as compared to exports. The Indian economy comprises a significant share of global consumption; focus on this market will be critical to drive growth and job creation. An export-oriented strategy alone will not be enough given the distribution of manufacturing resulting from Industry 4.0 and the growing consumer need for services, many of which are likely to be non-tradable. It is also important to know that the nature of domestic consumption will be different, with an increasing propensity towards services as households get richer and data and communication gets cheaper resulting in lower cost service availability.

In this section, we discuss in detail the immense growth and job creation potential in services and micro entrepreneurship, supported by the platform ecosystem and digitalization. Domestic demand has already been the focus of several policy interventions and has not been further elaborated.

Opportunities for Growth and Job Creation in the New Paradigm

SERVICES AS A DRIVER OF GROWTH AND JOBS

The rapid growth of the services trade, coupled with the growing share of services consumption in India, points towards the increasing demand for services. Businesses are modifying their operating models and moving to greater ‘servitization’ to cater to this increased demand. These shifts in demand and supply of services are increasing its

share in the economy and will result in significant potential for services-driven economic growth. Services also tend to be more labor-intensive than manufacturing and the potential for job creation through services-driven growth is significant.

In order to understand where to invest and drive growth in services for economic development and job creation, however, we need to understand the current state of various service sub-sectors. We segment the service sub-sectors into their current levels of penetration (measured as a share of GDP) and assess their growth potential (derived on the basis of benchmarks and global mega trends) in order to identify opportunities for growth.

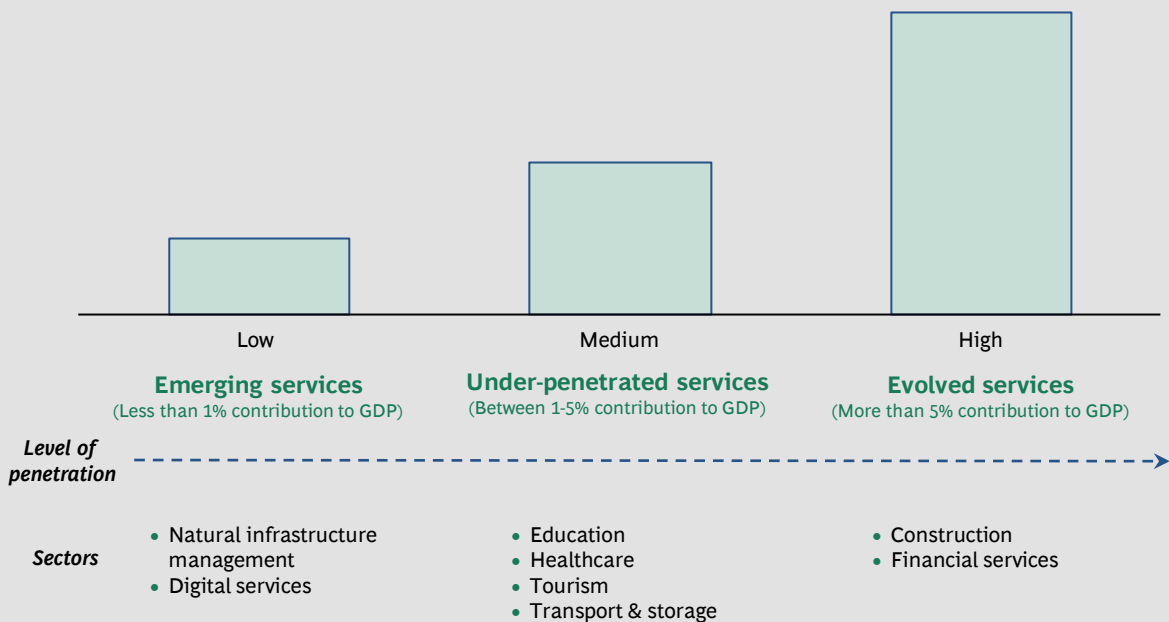
Exhibit 2.1 depicts this segregation based on the level of penetration of the sector into emerging, under-penetrated and evolved services.

- **Evolved services** like construction and financial services will continue to play an important role in growth and job creation. Physical infrastructure, especially roads,

railroads, ports and airports, will continue to be critical to the country’s development and there is significant potential for continued growth and job creation at the current rates.

- **Under-penetrated services** like health-care, tourism, transport and storage and education have historically had significant potential to drive both growth and jobs. However despite investments in these sectors, growth has been challenged. Opportunities exist today for these sectors to leapfrog via the use of digital infrastructure, the entry of newer non-traditional players and the opportunities for self-employment.
- **Emerging services** like natural infrastructure management (green energy, waste management, water and sanitation and rural development services), which are significantly under-penetrated, will see a higher demand given global mega trends towards energy and urbanization and the current state of service delivery in rural sectors. (As a benchmark, the 2016 annual

EXHIBIT 2.1 | Segregation of Services based on Level of Penetration of the Sector



Sources: Oxford Economics; BCG analysis.

review by the International Renewable Energy Agency (IRENA) estimates that jobs in the solar industry grew 12 times as fast as overall job creation in the US economy)². Additionally, there are a set of sectors like digital services (including content services, forward services in manufacturing, platform services etc.) which are on the rise globally and where India has a high potential for growth given its current strength in the Information Technology enabled Services (ITeS) sector. These emerging services sectors will require a strategic policy push in order to put in place the necessary conditions for them to grow and create jobs.

Hence, the services sector is poised to become a key driver of growth and job creation. To drive this growth, however, various challenges such as lack of infrastructure, gaps in skilling, low social security, underutilization of resources, and ineffective last mile delivery of services will need to be overcome. It is important to undertake a detailed review of the various challenges faced and put in place the right enablers to create an environment conducive to the growth of these sectors. The next section elaborates on the four key leverage points in the system and how a policy focus on these can support the growth of the services sector.

MICRO ENTREPRENEURS AS DRIVERS OF GROWTH AND JOBS

As discussed, global developments are changing the way enterprises and entrepreneurs function and compete with each other. Digital technologies are now enabling firms, however small they may be, to overcome the barriers to scale and access resources, customers, and suppliers easily. Individuals are finding it easier to become entrepreneurs, offering their time and talent in the market via the on-demand / platform economy through business models like Uber and Airbnb. Hence, the advantage of scale that existed earlier with large enterprises is now eroding as digital technologies make smaller enterprises more competitive. The new platform ecosystem which serves digitally savvy consumers and digitally connected devices is becoming the new ‘mass-manufacturing’ engine of a digital 21st century. As a result, platforms are creating









new opportunities for micro entrepreneurs, adding a new pillar to growth and job creation, in addition to large enterprises.

Platforms, in the form of marketplaces (e-commerce) such as Amazon and Flipkart, and aggregators across sectors such as Uber (in transport); Airbnb (accommodation); Swiggy (food delivery); and many others, use technology to bring together the various stakeholders in the system: product and service providers, customers and partners³. These platforms provide common services such as customer acquisition, payments and logistics, thereby reducing the barriers—such as sizeable investment in creating supply chains—to the growth of small enterprises. For example, Delhivery handles over 65,000 transactions a day across 180 cities and towns for 25,000 merchants and more than 800 e-commerce companies. It provides support to retailers and other e-commerce platforms for fulfilment, logistics, and data services, amongst other services. The merchants benefit by not having to set up individual fulfilment and sorting centers and get access to a large delivery network. Platforms like Amazon enable individuals to simply ‘log on’, share basic details about business, tax information and bank accounts and ‘begin selling in minutes’, thereby participating in the job market.

Alibaba, the most influential e-commerce enterprise in China, has enabled inclusive job creation for Chinese entrepreneurs. Exhibit 2.2 highlights two examples where hubs of economic activity have emerged in formerly rural locations or small towns based on the production and distribution of goods driven by demand generated via Alibaba. This could be replicated globally if Jack Ma’s proposal to build an electronic world trading platform, which will connect millions of customers to suppliers worldwide, becomes a reality.

Platforms create an ecosystem for self-employment, leading to more job creators rather than only job seekers. However, despite multiple initiatives by the Government and private sector already underway, micro entrepreneurs still face many critical challenges. These challenges include low adoption and availability of modern technology, non-avail-

EXHIBIT 2.2 | Alibaba has Enabled Towns and Rural Areas to Emerge as Hubs of Economic Activity

	Context	Change in Business Model	Impact on Growth and Jobs ¹
<p>From a Local Business to an Industrial Cluster: Wood Furniture in Shaji town</p> 	<p>Shaji had a local business of making wood furniture. Businesses were not very profitable.</p> 	<p>Selling furniture on Alibaba led to taking off of the industry and development of up/downstream businesses.</p> 	<p>Now over 4,000 online traders with 15,300 employees (within 8 years of development).</p> 
<p>Success of Anyue Farm Products Through E-commerce Transforming Lives of Farmers</p> 	<p>Anyue county is one of the richest agricultural areas in China producing lemons. Farmers unable to reach consumers directly.</p> 	<p>With launch of rural Taobao by Alibaba, farmers in Anyue began to register online stores to sell lemons and related products.</p> 	<p>The county has over 4,700 online stores with over 15,000 employees (within 5 years of farmers going online).</p> 

Source: 'E-Commerce in China—Opportunities for Asian Firms', International Trade Centre (in partnership with Alibaba Group and Ali Research), 2016.

¹As of December 2015.

ability of timely and affordable credit, lack of skilled manpower, operational issues and others. Key leverage points in the system that need to be activated to support this ecosystem have been elaborated in the next section.

NOTES

1. 'The Future of Work in the Developing World', Brookings Blum Roundtable, Post-Conference Report, 2016, provides details on job matching platforms that can be leveraged for identifying opportunities for more traditional types of employment.

2. For further details on each of these sectors please refer to the report, 'Future of Jobs in India- Enterprises and Livelihoods', CII, 2016.

3. 'An Alternate View of the Future', Nandan Nilekani, 2016.

LEVERAGE POINTS THAT WILL CATALYZE CHANGE

THIS SECTION DESCRIBES FOUR leverage points that need a concerted policy push in order to drive job creation in the new paradigm of growth and development. It is important to note that we are not saying that existing systems will cease to be relevant; the new leverage points are important additions in the new paradigm and cannot be ignored if we are serious about achieving this rapid pace of growth and job creation.

Build Digital Infrastructure

Studies comparing India with other emerging countries including China and East Asian nations show that India substantially lags behind in terms of access to healthcare, education and skills training among other metrics. One critical component to develop these sectors and also aid in the rapid economic growth of any country is physical infrastructure. The investment required in physical infrastructure to overcome the many challenges to development, access, etc. is significant. However, in the new paradigm, digital infrastructure can provide an opportunity to leapfrog and bridge some of this gap in several domains. Digital technologies offer solutions that were not available before and enable scale, coverage and access at a fraction of the cost.

The term ‘digital infrastructure’ is used to describe a set of solutions or digitally connected products and services which are built on service platforms and an interoperable layer to facilitate payments, authentication, etc., all of which are built on an underlying high-speed

broadband, cloud and mobile / devices infrastructure. The layered formation of services, platforms and the underlying infrastructure is often referred to as a ‘technology stack’. Development of this infrastructure has the potential to be a critical enabler of growth in the new paradigm where services and micro entrepreneurs form the core.

TECHNOLOGY STACKS BREAK THE COMPROMISE BETWEEN COST AND SCALE

Technology stacks provide the advantage of scale and integration without the need for a player to invest in all layers of the stack. This benefits both incumbent players as well as new entrants. The shift brought about by technology stacks can be described as follows:

- Traditionally, firms used vertical integration to expand their business operations and drive growth. By investing in and controlling the different layers of the value chain, firms gained the advantage of lower transaction costs and economies of scale.
- Today, technology stacks are eroding the benefits of vertical integration by breaking the compromise between cost and scale. Technology has reduced the need for integration (for lower transaction costs) and investments (to scale up). Firms no longer need to be present and competitive in all layers of the value chain. They can use stacks to benefit from scale and efficient utilization in the lower and middle layers (with little or no investment); and innovation and efficient

consumer interface in higher layers (without full integration).

Exhibit 3.1 below provides the vision of a technology stacked architecture across sectors, as laid out by the team at EkStep Foundation. The implications of this for policymaking are described later in this sub-section.

TECHNOLOGY STACKS GROW THE MARKET BY LOWERING BARRIERS TO ENTRY

Technology stacks provide three benefits to new entrants:

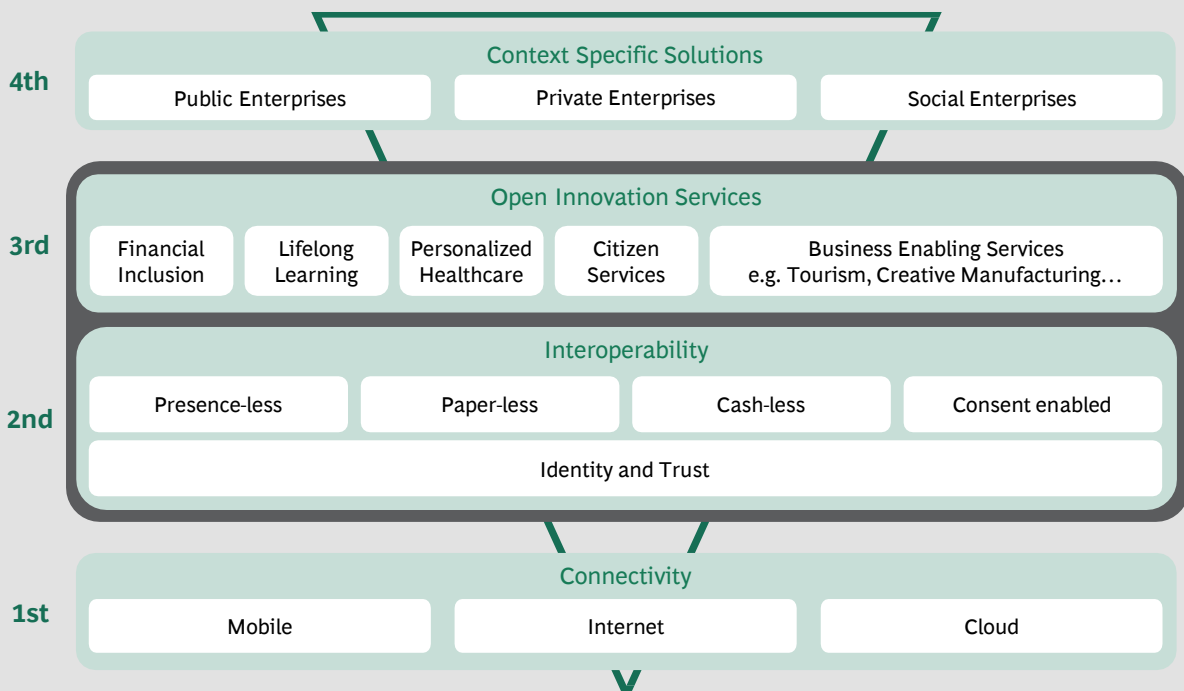
- Improved access to resources (data, connectivity, payments, capital).
- More efficient service / product delivery (speed and quality of delivery).
- Improved access to markets (larger, more efficient markets).

New enterprises get the benefits of scale and integration without themselves investing in all layers of the stack. They can build solutions on existing layers of the stack, thereby using their

resources efficiently. This includes invaluable access to consumption data (easy identification / tracking of consumers), connectivity (network and devices), payment services (through Unified Payments Interface (UPI) and Aadhaar) and capital (through use of data, bank accounts and Aadhaar). They improve speed of delivery with faster demand-supply matching; and enhance their quality of delivery by using optimized servicing models. Finally, they provide access to a wider consumer base and easier acquisition and access to more efficient markets through better pricing and more complete information on demand and supply. Stacks enable new entrants (who are often micro entrepreneurs) to grow and compete with limited investments and scale, and open up the market.

As an illustration, the use of technology stacks can lower the cost of credit services significantly. A set of experiments was run by iSpirit and partners to disburse small ticket size, collateral-free, low interest institutional credit or ‘5 minute loans’ to financially underserved communities using digital data trails as proxies for credit appraisal. These experiments leveraged

EXHIBIT 3.1 | Architecture of India's Technology Stack



Source: EkStep Foundation.

one or more layers of the India Stack. One of the key findings was that leveraging all the layers of the stack could potentially lower the existing transaction cost to Indian Rupees (INR) 30 against the existing cost of INR 130, when all the layers of the stack were not activated. For a new entrant in the credit system on the India Stack, iSpirit estimates that they can expect additional savings of 60 percent on originating and underwriting. On loan servicing which is 15 percent of the overall costs, expected savings are 50 percent. On collections which are 10 percent of the overall costs, expected savings are 30 percent. Large benefits are likely to accrue across sectors.

TECHNOLOGY STACKS CAN DRIVE FASTER GROWTH ACROSS SECTORS

Technology stacks can drive faster growth across sectors in three ways:

- By improving ease of consumption.
- By improving quality and quantity of supply.
- By causing a shift to more efficient markets.

For consumers, technology stacks provide higher availability and access (more competition and choice); better service delivery (customized offerings); ease of payments (frictionless transactions); and better after sales services (continued relationships). Stacks also improve the overall quantity and quality of services / products on offer. This is made possible by more competition and better data on consumer patterns available to all players. Finally, the market is made more efficient by reducing information asymmetry; increasing ease of communication; better price discovery; and reduced friction in transactions. Together, these factors can drive significant growth and efficiency in sectors like education, healthcare, financial services etc.

To further illustrate this point, let's take the example of the healthcare sector. A platform can be built that uses a central data registry to store all patient medical records. It is build on the India stack which can allow paperless consent-enabled Aadhaar authentication to access documents from an individual's digital locker; or cashless payments through insurers,

etc. This platform can have a set of connected medical facilities so that doctors in one hospital can access any patient's lifetime medical history. Further, transfer of patients between facilities is seamless so patients can get the appropriate care from specialists in other facilities. A range of applications (apps) can be built leveraging this platform and the underlying data and services. For example, a marketplace app for matching providers and patients, a lifestyle and health management app using medical data, data generated from wearable devices etc.; the possibilities are endless. This platform architecture can drive growth through improved access, service delivery, efficiency and greater variety of offerings.

POLICY INTERVENTIONS TO REALIZE THE FULL POTENTIAL OF TECHNOLOGY STACKS

With no legacy digital infrastructure to emulate or replace, India is truly uniquely positioned to build a robust digital infrastructure that can fuel its growth disruption. Several initiatives have been launched by the Government under the umbrella of Digital India. India Stack, one such initiative, is a disruptive solution to provide interoperability in the stack. It builds on the existing infrastructure layer comprising JAM—Jan Dhan, Aadhaar and Mobile. Its 'presence-less, paperless, cashless' system is a way to promote the services layer of the stack as a 'public good'. However, policymakers need to think more broadly about how to build and facilitate the development of the other layers of the stack across sectors.

An important question is who will be responsible for building the third layer of the stack which is the services or platform layer (for example healthcare, financial services etc.). There are two options. The first option is to build this layer of the stack as a private platform. Private investments in this layer (especially by players who have invested in lower layers for example, infrastructure), if unregulated, will likely result in a high user fee to access the platform layer and distort access for other players. Therefore, strong regulation will be required in order to ensure that standards and norms of interoperability, non-monopolistic pricing etc. are maintained. Another option, as recommended by EkStep Foundation, is to build the platforms in the third layer as a set of open, societal platforms or a 'public good',

not locked in for the benefit of a few players. EkStep itself is a societal platform in the education space. It is built as an open technology platform with Application Programming Interfaces (APIs) that allows partners (individuals and enterprises) to develop solutions for teaching, leveraging the content, concepts and tools free of cost (see Exhibit 3.2).

However, private individuals and foundations cannot solely be relied on to build societal platforms. The Government needs to put in place a policy framework for funding, building, overseeing and regulating the third layer of the stack. This policy framework can serve to incentivize private players to participate for return with appropriate regulation to ensure access; or it can be structured such that the platforms are built as a public good through a combination of public and private funding, as with other physical infrastructure like roads.





Building this digital infrastructure is a complex task and one that will require significant planning, mobilizing and coordination; there are multiple stakeholders (both public and private) across sectors. There are different in-

stitutional models that have already been put into place to manage the development of various layers of the stack: Unique Identification Authority of India (UIDAI) was set up for conceiving and implementing Aadhaar; National Payments Corporation of India (NPCI) is responsible for overseeing the 'cashless' layer of the India stack with UPI; and several other public, private and joint institutions are involved. In order to oversee the development of this digital infrastructure, including but not limited to the societal platforms, a convening body will be required. We propose the setting up of a 'National Digital Authority of India' (NDAI), which can serve as a regulatory body and oversee the building of the technology stacks across sectors. The NDAI can also be responsible for setting norms and regulations around security, accessibility, pricing etc and ensuring interoperability.

Improve Access to Risk and Growth Capital

Micro entrepreneurs will be an important pillar of the growth and jobs paradigm going forward. In order to support the development of

EXHIBIT 3.2 | EkStep: A Societal Platform Addressing the Needs of the Education Sector

 <p>Purpose</p>	<ul style="list-style-type: none"> EkStep aims to provide equitable access to learning opportunities for primary school children in India; through its universal, collaborative platform to reimagine learning opportunities. 			
 <p>Model</p>	<ul style="list-style-type: none"> EkStep is a layered, modular platform that allows co-creation of solutions that are agile & scalable. The EkStep platform infrastructure and tools facilitate interactions between learners, learning facilitators (teachers, parents etc.), service providers (Government, schools, tuition centers etc.) and content creators (educationists, content developers etc.); increasing opportunities to learn. Currently, a mobile app is used, with plans underway for other diverse media in the future. 			
 <p>Advantages</p>	<p>Learners (Students)</p> <ul style="list-style-type: none"> Access to interactive learning Access to feedback on progress 	<p>Learning Facilitators</p> <ul style="list-style-type: none"> Access to varied learning content Insight into progress of learners 	<p>Service Providers</p> <ul style="list-style-type: none"> Configurable content to suit varied needs and infrastructure Data and analytics on learning and usage patterns 	<p>Content Creators</p> <ul style="list-style-type: none"> Tools and templates for creation of relevant content Insights on needs of children
 <p>Potential Impact</p>	<ul style="list-style-type: none"> Increased access to learning, especially interactive learning 	<ul style="list-style-type: none"> Easier for people to enter into teaching, hence also addressing the supply problem 	<ul style="list-style-type: none"> Increase in capacity to serve society's learning needs 	<ul style="list-style-type: none"> Educational content will be in line with the learning and industry needs

Source: EkStep Foundation.

these entrepreneurs, it is critical for them to have access to 'risk and growth capital'. These entrepreneurs are typically ineligible for loans or other forms of credit through traditional financial systems due to inadequate security and the lack of proven credit records, amongst other factors. Therefore, ensuring access to risk and growth capital is critical.

There are three challenges to accessing risk and growth capital:

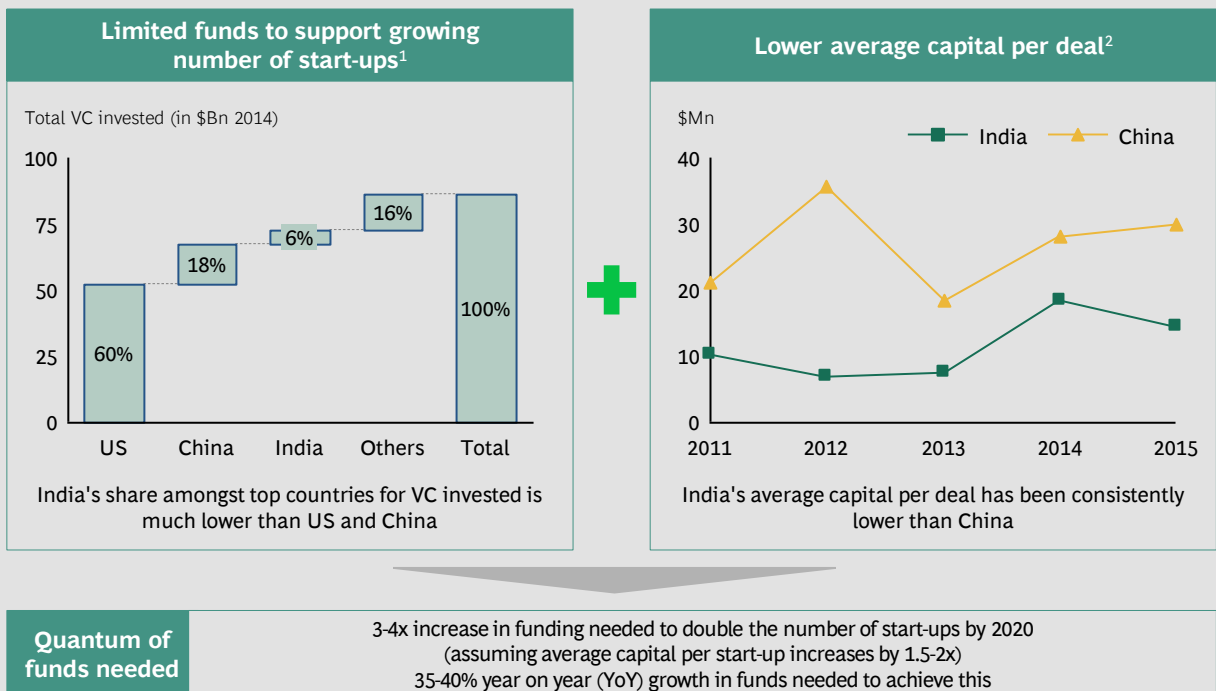
- Lack of supply of credit and inadequate credit facilities. This is also a problem for traditional Micro, Small and Medium Enterprises (MSME) accessing both formal and informal channels, however we limit our discussion to risk capital and micro entrepreneurs as these are less talked about.
- Complexity of schemes and absence of centralized information about them.
- Stringent and outdated entrepreneur assessment and eligibility criteria leading to financial exclusion.

CRITICAL TO INCREASE QUANTUM OF RISK AND GROWTH CAPITAL

NASSCOM reports that the Indian (technology) start-up base is expected to witness an annual growth of 10-12 percent. Despite a decline in funding by 20-30 percent over the last year, they describe the future investment scenario for technology start-ups as 'cautious but healthy'.¹

Preqin tracked the average deal capital raised per start-up and found that from 2005-2015 the average deal capital in China was approximately 1.5-2x India. This gap has substantially increased in the last year, driven by both the rapid growth in the number of start-ups in India as well as the decline in total funding growth. The World Economic Forum (WEF) estimates that of the top countries for Venture Capital (VC) investment in 2014, 60 percent of total funds were invested in the US, 18 percent in China and only six percent in India. Our estimates suggest that in order to double the number of start-ups by 2020 (and to raise the funds per start-up by 1.5-2x), funding would need to grow by 3-4x. To increase the funding by 3-4x in this period, the rate of growth would need to be 35-40 percent. This has been illustrated in Exhibit 3.3.

EXHIBIT 3.3 | Consistently High Growth in VCs Needed to Support the Growth in Start-ups



Sources: WEF, Preqin.

¹Which countries have the most venture capital investments?, WEF; 'Others' denote Israel, Canada, Europe.

²Deals in the VC space, covered by Preqin.

Hence, for India's start-up ecosystem to sustain its growth in the context of global competition, efforts have to be made to increase the growth in VC funding to enable the start-up ecosystem to flourish.

INFORMATION IS A FIRST STEP TO BETTER ACCESS

A second challenge is that while India offers several schemes for start-ups and MSMEs, these are often complex and overlapping (in addition to being reserved for enterprises rather than entrepreneurs). Most of these schemes aim to provide one or more kinds of services—direct loans and guarantees to specific populations, ‘fund of funds / corpus of funds’ or access to investors—but they overlap. Inadequate clarity on the eligibility criteria, rules of application, etc. add to the complexity and confusion. All this makes it difficult for enterprises to choose the right scheme. While the Government has taken a few steps to provide a list of central schemes (with funding, eligibility criteria, etc.), there are lessons to be learnt from countries like Canada which has done an excellent job of organizing a list of all available schemes (central and state level) by type of grant and eligibility criteria, thereby allowing the target enterprises to better utilize the schemes.

FIN-TECH TOOLS CAN REVOLUTIONIZE CREDIT ASSESSMENT

The third challenge is that traditional lending systems are still plagued with outdated credit assessment processes. Two such practices which specifically hurt micro entrepreneurs are the need for a collateral guarantee and use of credit scores. This collateral is a key roadblock, hindering a new firm's access to capital as a start-up, new business may not have real-estate or equipment which the bank considers valuable enough to lend against. Further, a good credit score, which is essentially a function of the credit history of a business, is often used by banks as a criterion to give loans to small businesses. Many micro entrepreneurs cannot meet these criteria as they are simply too new to have a credit history and credit scores. While transforming traditional banking / lending systems is not a trivial task, there are lessons to be learnt from domestic fin-tech players as well as from governments globally.

New age fin-tech players (and some traditional lenders) are acting as drivers of financial inclusion by using advanced data and flexible approaches to meet the demands of micro entrepreneurs (and more widely, the unbanked population). Their approach includes improving the eligibility criteria for loans / credit, higher individualization and customization of products and providing better access to the funds. Fin-tech firms use a combination of social footprint data and advanced analytics to come up with the eligibility criteria for a loan, thereby rendering collateral or credit scores inconsequential. They also use social footprint data for higher customization of products based on consumption patterns and deploy platforms to create greater access for consumers.

POLICY INTERVENTIONS FOR IMPROVED ACCESS TO RISK AND GROWTH CAPITAL

Potential interventions to overcome the aforementioned challenges are as follows:²

- Improve availability of funds by driving funding through both private and public channels and building an ecosystem to attract venture capitalists and angel investors. Innovative models such as peer-to-peer lending, using technology to support credit market places that connect thousands of lenders with millions of borrowers, etc. should be encouraged³.
- Ease the assessment process through use of technology stacks and alternative data in the credit approval process; collaborate with fin-tech firms to take advantage of their analytical ability and access to data to build better portfolios in banks.
- Improve access to information on schemes by creating more transparency around information about sources of funding and eligibility criteria.

Develop Life-long Learning Systems

The skilling and learning ecosystem faces three significant challenges, described below:

- There are several factors, including but not limited to technology adoption, that are

rapidly and continually changing the shape of enterprises and industries. As a result, the nature of work and the skills required for these jobs is also changing. The learning and skilling ecosystem needs to keep up with these changes in order to ensure workers have the relevant skills required of the labor force.

- The current learning system was based on the premise that people use this foundation to start their work life and continue in the same job over their lifetime. This trend is changing rapidly. People are changing roles and jobs with increased frequency; and a large number of people are moving towards ‘contract’ / freelance work. The need to re-skill and align the needs of industry with job seekers is ever more crucial and challenging, since organizations may be wary of ‘investing’ in skilling individuals whose duration with their organization is less certain.
- The overall skill profile of the labor force is likely to change as a result of the types of tasks that will get automated (routine and manual tasks). While digital infrastructure will be important to drive growth, it will not work alone; a newer profile of jobs will be generated as a result of automation. Complementarity will need to be maintained between people and technology and this can be achieved through skilling.

While the current skilling ecosystem cannot be radically overhauled, there are a few principles that need to be built into the system to re-imagine ‘what, how and when’ skills need to be imparted. These principles are as follows:

- **Continuous, life-long learning:** Continuous access to refresher programs and continuous updating of skills over an individual’s employment journey commensurate with the changing roles and requirements to keep the skills relevant.
- **Just-in-time, modular:** Emphasis on learning to be just-in-time and needs-aligned, rather than on a just-in-case basis where skills are taught for possible future need.

- **Customized / individualized:** A shift away from batch-learning via standardized modules to individualized learning via content relevant to the learner.
- **Forward looking:** While the kinds of jobs and skills cannot be predicted, labor market trends provide clues as to what will be relevant. A study by BCG and WEF concludes that students must develop and master social and emotional learning (SEL) skills to thrive in the 21st century⁴. These include collaboration, communication, and problem solving. Research by BCG on the impact of automation on work in Australia finds that there will be an increase in the demand for cognitive and non-routine jobs, and workers will need the skill-set to manage these tasks accordingly. Business skills will be necessary to develop with the growing micro entrepreneurship ecosystem⁵.
- **Aligned with needs of industry:** Curriculum that is aligned with employers’ demand for skills. The UK is shifting away from traditional classrooms into ‘learning centers’ that are more responsive to industry demands.
- **Leveraging technology:** Technology can serve as an enabler and catalyst to ensure learning is continuous, modular, personalized etc. Various ed-tech start-ups in India are already developing solutions that leverage these principles.
- **Routinely accessible to all:** The practicalities of life-long learning during adult life needs to be addressed; many people may not be able to afford to invest in learning at the cost of giving up work, leading to even greater inequality. Countries such as Singapore have initiated programs such as ‘Individual Learning Accounts’ where every citizen over 25 is given a few hundred dollars to spend on courses from any of 500 approved providers⁶.

POLICY INTERVENTIONS TO SUPPLEMENT THE CURRENT LEARNING SYSTEMS⁷:

- Invest in the appropriate technology stacks and platform layer to improve

accessibility to learning systems and continuous learning.

- Encourage and enable greater industry participation in content and curriculum design.
- Support and help improve the quality of ‘skilling at scale’ that is being provided by the aggregators across sectors such as tourism (OYO Rooms), transport (Ola Cabs), etc.⁸
- Encourage the development of programs such as ‘Individual Learning Accounts’ in workplaces and for the unemployed.
- Set up and encourage setting up of systems for the measurement and assessment of interventions in the skilling and learning ecosystem⁹.

Revisit and Extend Labor Laws

A full-time job with a single employer has been considered the norm for decades. However, this increasingly fails to capture how a large share of the workforce now earns a living. Outsourcing and subcontracting have led to the beginning of flexible work contracts. New forms of employment arrangements are rapidly evolving as digital platforms create large-scale, efficient marketplaces where workers connect with buyers of their services. These emerging work relationships and micro entrepreneurs often fail to fit into existing legal definitions of terms like ‘employee’ and ‘independent contractor’. The distinction is important because employees qualify for a range of legally mandated benefits and protections that are not available to other more flexible workers, such as the right to organize and bargain collectively, workers’ compensation, insurance coverage, and overtime compensation.

This has led to many disputes in recent times where workers have questioned their employment status. Approximately 385,000 Uber drivers in California and Massachusetts filed a class-action lawsuit against Uber regarding their employment status. These drivers maintained that they were akin to employees based on the control exercised by Uber over

their prices, schedules, customer assignment, etc. Hence they should be entitled to benefits like minimum wage and job security. Uber, on the other hand, maintained that it was simply an aggregator platform connecting self-employed drivers to customers. The suit was initially settled for US\$100 million on the condition that drivers continue to be classified as independent contractors but with some protection such as recognition of a drivers’ association and protection against unfair dismissals. However, a recent ruling now requires the Uber drivers to take their individual claims to private arbitrators. Other examples include Housejoy, a cleaning start-up that shut down after being embroiled in a long battle over the employment status of its cleaning contractors; and Luxe Valet and Shyp, who chose to convert their contract workers to company employees amid intensifying pressure around the issue. These instances illustrate the uncertainty over worker status and the applicability (or lack thereof) of existing labor laws.

Social security and labor laws for the entire workforce, especially in the unorganized sector, have long been debated¹⁰. The intent here instead is to focus on a set of questions that need to be addressed through the policy framework to protect micro entrepreneurs and workers in the growing on-demand economy.

- **How should these workers be classified?** Given the marked differences between the rights and entitlements of employees and independent contractors, it is very important for policy makers to discuss and define what should be the employment status in the non-standard forms of employment.
- **Should a new class of workers be created?** Some legislatures across the world have proposed the creation of a new third category of worker—the dependent contractor or an independent employee, a hybrid between an independent contractor and a full-fledged employee—to adapt the laws to economic realities.
- **What are the benefits that these workers should be entitled to?** While defining the nature of employment, policy makers

will also have to determine the employment rights that they should be entitled to.

- **Given the lack of stability, how does the Government engage in providing social security?** Since the workers face no financial stability under the new work arrangements, it becomes more important for the Government to re-think the coverage and benefits of social security schemes.
- **How do we ensure these workers participate in the formal economy?** Given that 92 percent of India's employment is currently in the informal sector, and measures to formalize them have met with mixed success over the years, it is essential that these new types of jobs are created in the formal sector¹¹.

Globally, governments are thinking about similar questions posed by the emergence of the on-demand economy. Addressing these questions will be the key to ensuring the success of micro entrepreneurship as an avenue for increased job creation. India should also invest in creating forward looking labor laws for the new segment of workers. Starting a dialogue on these matters by engaging with and getting relevant stakeholders together to understand the various needs and issues can catalyze this process.

To conclude, a strategic policy focus on the four leverage points (technology stacks, risk and growth capital, life-long learning and labor laws) is critical to drive growth and job cre-

ation in the new economic development paradigm. The Government has already recognized the need for this; many policy initiatives such as Ease of Doing Business, Digital India and Startup India, among others, are setting the ground and providing a solid foundation for this ecosystem to flourish. What is needed now is concerted and focused implementation of these policies as well as a continuous review of any gaps in this dynamic ecosystem.

NOTES

1. 'Indian Start-up Ecosystem Maturing', NASSCOM, 2016.
2. The report on 'Future of Jobs in India- Enterprises and Livelihoods', CII, 2016 provides more information on access to finance to the last mile.
3. 'An Alternate View of the Future', Nandan Nilekani, 2016.
4. 'New Vision for Education: Fostering Social and Emotional Learning through Technology', WEF (in collaboration with BCG), 2016.
5. 'The Future of Work in the Developing World', Brookings Blum Roundtable, Post -Conference Report, 2016.
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7. More details are provided in 'Future of Jobs in India- Enterprises and Livelihoods', CII, 2016.
8. 'An Alternate View of the Future', Nandan Nilekani, 2016.
9. 'The Future of Work in the Developing World', Brookings Blum Roundtable, Post -Conference Report, 2016.
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11. 'An Analysis of the Informal Labor Market in India', CII, 2014.

BRIDGING THE GAP: ESTIMATING THE JOB CREATION POTENTIAL

THE PRECEDING SECTIONS LAY out the new paradigm of growth and development. They elaborate on the potential of services, along with micro entrepreneurship, to drive growth. They also highlight the leverage points in the system that need to be activated to achieve this. However from a policy perspective, there remains the question of how the job gap of 4-7 million jobs per year can be bridged.

In this section we summarize the sectors and their job creation potential given the macro economic factors we have elaborated in this report. We have also attempted to quantify how many incremental jobs it will be feasible to create in India and whether this alone can plug the gap of 4-7 million jobs. Our objective is not to do a bottom-up forecasting of the number of jobs that will be created, but rather to look at global benchmarks and megatrends to understand how many incremental jobs it will be feasible to create. Our assessment is based on the expected growth in the sector and labor intensity of the sector. We continue to assume that growth will be a moderate 6-7 percent, rather than the target 8 percent. Hence, while this approach allows us to arrive at a range of jobs that can feasibly be created with minimal interventions assuming the right investments and enablers are put in place, these numbers are likely to be a conservative estimate of the number of jobs that will actually be created. A brief

summary of this is given below as per the various sectors categorized.

- Manufacturing is unlikely to be a significant job creator in the medium to long term. However, some large opportunities exist in the near term.
 - **Heavy manufacturing (basic metals, chemicals, equipment manufacturers, etc.):** These sectors will undoubtedly be impacted by Industry 4.0 and are unlikely to be core job creators in the long term. Industry 4.0 will lead to capital deepening, productivity improvements and labor replacement, and likely on-shoring of manufacturing. The impact on jobs will be greatest in the more capital-intensive heavy manufacturing sectors. These sectors currently add 3.5-4 million jobs per year and we believe they will add 3-3.5 million jobs per year in the short to medium term (or fewer if we assume faster adoption of Industry 4.0 technologies). Even a rapid growth in contribution to GDP is unlikely to sustain the current level of job creation, given that these industries are heavily impacted by Industry 4.0.
 - **Light manufacturing (textile, leather, etc.):** These sectors present a sizeable opportunity for job creation in

the immediate term. Given the adverse impact of Industry 4.0 and automation, it is unlikely that manufacturing will be the core driver of job creation in the medium to long term. However, in the short term, there are certain shifts taking place globally across a set of light manufacturing sectors like textiles, leather and footwear, where there is an opportunity for India to capture a share of the global pie. The productivity adjusted wage rates in China have increased at a CAGR of 11 percent in the period 2006 to 2014, leading to a decline in China's competitiveness in areas including textiles. There is evidence that some industries are shifting away from China to other Association of South East Asian Nations (ASEAN) countries, the US and the European Union (EU). For instance, the apparel, made-ups and textile industries are on the cusp of their largest ever shift in history. India is uniquely poised to take advantage of these shifts and attract production capacity moving out of China. A stable political environment, sustained economic growth momentum, population dividend and cheap labor are some of the advantages that India has over other countries. The Government has already taken various steps to attract foreign investors, one of the key policies being Make in India. Amongst other areas, the policy focuses on growth in labor-intensive sectors such as textiles with a strong incentive package. Such and other initiatives can lead to an increased contribution to jobs from 0.5-1 million per year to as many as 2.5-3 million per year.

- Services will play an important and integral role in generating jobs. The scale of jobs and the area of focus for each will vary as follows:
 - **Evolved Services (construction, financial services, etc.):** These sectors will continue to create jobs at the current trajectory. Evolved services like construction and financial services

together add 3.5-4 million jobs per year. The construction sector has been a significant creator of jobs, driven by the impetus from Government to develop the national infrastructure. It will continue to contribute a large share of jobs created. The financial services sector, on the other hand, is less penetrated than in some developed nations but contributes a high percentage to India's GDP due to lower contribution by some of the other sectors. Given that these sectors are already at a very high level of contribution, their growth is expected to continue on trajectory and incremental job creation (over current levels) is likely to be low. Therefore, we expect the evolved services sector to sustain the level of job creation at 3.5-4 million jobs per year.

- **Under-penetrated services (education, healthcare, tourism, transport and storage, etc.):** These sectors will be strong incremental contributors to job creation as a result of their growth potential in the new economic development paradigm. These services, which currently contribute a meager 0.5-1 million jobs per year, have a significant potential to grow and add jobs. This growth can be driven by the currently large and unaddressed demand for these services as well as the high labor-intensity of the sector. Moreover, lessons from countries like the UK show that use of technology stacks and platforms can improve last mile delivery; and focused skilling initiatives can provide a huge boost to sectors like education. Such and similar enablers can also contribute to the overall job potential of 3-3.5 million per year.
- **Emerging services (natural infrastructure management, rural services, digital services, etc.):** These sectors will need to be invested in significantly in order for them to generate employment that is critical to bridging the demand-supply gap for jobs. The current contribution to GDP

of sectors like digital services, natural resource management, etc. is negligible. In order to bridge the gap, these sectors will need to create up to one million jobs per year, which is not insignificant.

Thus, from a policy perspective, it is critical to focus on a mix of services and light manufacturing sectors to drive job creation. Emerging and under-penetrated services along with the light manufacturing sector (in the short run) have the potential to meet the current demand of 12-15 million jobs, while covering

for the loss of jobs driven by the impact of Industry 4.0 on the traditional manufacturing and services sectors¹. The focus on these sectors clubbed with the use of the right mix of enablers can, therefore, alleviate the challenge of low job creation despite high GDP growth.

NOTES

1. For more details on the impact of Industry 4.0 on work, please refer the appendix.

CONCLUDING THOUGHTS

THE TWIN FORCES OF growth in digital technologies and growing economic nationalism are radically changing the paradigm—in the way countries grow and the way we work. The new globalization is resulting in lower global growth as a result of the reduction of global merchandise trade; erosion in the cost competitiveness of labor-intensive countries due to the impact of Industry 4.0 on productivity; and a need to rethink the China development model of export-led manufacturing-driven growth. Furthermore, the growth path India has been on—driven by capital deepening and resulting in higher labor productivity—alone will not lead to more jobs. A policy strategy not only for growth but also for job creation is imperative. Given this context, India's aspirations and goals for growth and job creation are both truly formidable, yet not unattainable.

There is a growing set of opportunities due to servitization and the growth in the platform economy which is resulting in a new economic development paradigm. Under this new paradigm, three pillars—domestic demand, services (both traditional and emerging) and micro entrepreneurs—have the potential to propel growth and job creation. In the immediate short term, opportunities in the light manufacturing sectors due to shifts from China are also present which ought to be seized by India. Hence, to achieve our aspirations, we need to quickly reorient our policy priorities to succeed in this new paradigm and drive growth in ser-

vices as well as support the growth in micro entrepreneurs. It is important to note that the traditional levers of growth and development will continue to play a role in driving growth, and existing strategies to support them must not be abandoned.

The need of the hour is to intensify the focus on four 'leverage points'—which together can create catalytic impact. These leverage points, namely, digital infrastructure, risk and growth capital, life-long learning systems, and comprehensive labor laws require a strategic policy focus followed by action so that they can be leveraged to allow the services sectors and micro entrepreneurship to flourish.

This report is intended to serve as a pragmatic call to action to the various stakeholders in the ecosystem—policy makers, industry, development sector and others. They need to come together and, through collective thought and action, recognize the necessary policy initiatives that are urgently needed to leverage the enablers described in the new paradigm. These enablers will address and help overcome India's specific challenges and obstacles that impede its growth and development. The jobs and growth ecosystem needs the urgent and active participation of all the stakeholders in the system to come together to meet India's development objective to transition from a lower-middle income country to an upper-middle income country over next two to three decades.

APPENDIX: THE IMPACT OF INDUSTRY 4.0 ON GROWTH AND JOBS

AN IMPORTANT THEME EXPLORED in the report is the impact of Industry 4.0 on the growth and jobs paradigm. As we stated in the executive summary, the increase in productivity due to Industry 4.0 is leading to a re-shaping of global supply chains, thereby altering the effectiveness of a growth and jobs strategy that relies predominantly on export-oriented large-scale manufacturing. In this appendix we share a summary of several expert reports that analyze the impact of Industry 4.0 on jobs and 'work'.¹ Given the differences in quantitative estimates (further discussed below), it is important to focus on the directional impact and understand the implications across sectors. The objective of this appendix is to provide policymakers with a starting point to initiate a more effective discussion around Industry 4.0, growth and jobs, and to start to think about putting in place the necessary policy frameworks to manage the inevitable transitions and leverage the emerging opportunities.

Cross-country Impact of Industry 4.0 on Jobs

Several agencies and experts have attempted to estimate the impact of Industry 4.0 on jobs. Table 1 provides a cross-country view of the quantitative impact, which suggests that the range of work at risk of automation is from 35-85 percent.

The International Labor Organization (ILO) estimates that developing countries are at higher

risk of automation due to the greater proportion of individuals engaged in low-skill work and the lower diversity of activities within the economy. Other studies conclude that given the low wages in emerging economies, while the probability of automating tasks is high due to the nature of the work, the likelihood of replacing jobs is low due to the wage levels. For example, the Brookings Blum Roundtable concludes that it is possible that workers will be paid lower wages, thereby diminishing income, rather than eliminating their jobs altogether.

While we have attempted to summarize the impact of Industry 4.0 on 'work' across studies, the comparison is challenged and must be considered directional rather than exact in magnitude. There are significant differences across and within country estimates due to five differences in assumptions:

- **Definition of 'work' differs:** Each study reports the impact of Industry 4.0 on different metrics. Some quantify the share of tasks that are at risk of automation; others quantify the share of employment or full time equivalent employment that is at risk of automation; and finally a few quantify the actual share of jobs that will be lost.
- **Classification of work:** Many studies estimate the impact of Industry 4.0 on specific tasks; assumptions about the share of these tasks by occupation vary consider-

TABLE 1 | Overall Impact of Automation across Countries on Work¹

Region	Percentage of work at risk of automation
India	52% to 69%
Europe (Big 5)	46%
UK	35%
OECD Average	57%
Japan	55%
US	46% to 47%
Australia	37%
ASEAN-5	56 %
Thailand	44% to 72%
Vietnam	70%
Cambodia	57%
Indonesia	56%
The Philippines	49%
Rest of the World	50%
Ethiopia	85%
China	51% to 77%
South Africa	67%
Argentina	65%
Nigeria	65%

Sources: World Bank, MGI, BCG, Frey & Osborne, ILO and CITI GPS & Oxford Martin School.

¹The definition of work varies across the studies based on their methodology. It ranges from the 'tasks' at risk of automation to the share of employment or full-time equivalent employment (FTE) at risk of automation to the number of jobs at risk of automation. McKinsey Global Institute (MGI) estimates the share of tasks that will be automated; BCG, Frey & Osborne and the International Labor Organization (ILO) estimate the share of employment or FTE at risk of automation; and the World Bank refers to the proportion of jobs threatened by automation.

ably across studies. This is also a function of differences in skill levels and industry structures across countries.

- **Rates of technology adoption:** Different studies assume a different probability of automation for a specific task or occupation. Additionally, there are a range of assumptions about the pace of technology adoption across and within countries, stemming from differences in the feasibility of application or development of specific solutions; differences in the costs of developing and deploying solutions; and different assumptions about regulation of these technologies.
- **Sector growth:** Different studies assume different growth rates across sectors or industries. However, more importantly, some studies assume that the productivity-enhancing effect of Industry 4.0 will result in an expansion of some industries, and thereby more job creation.
- **Labor and workforce composition:** Assumptions about both the size and com-

position of the workforce vary considerably based on demographics, wage rates, skill levels, etc. These assumptions in turn drive differences in the impact of Industry 4.0 on jobs.

Despite the differences in methodology and outcomes, it is reasonable to conclude that Industry 4.0 will have an impact on jobs. However, and perhaps most important, this impact is not limited to automating or eliminating jobs altogether. There are two other possibilities—jobs will be augmented as a sub-set of tasks is automated, therefore requiring greater human effort for complementary tasks; and jobs will be added as the relative work profile of the labor force changes as a result of automation. This is discussed in further detail in the next sub-section.

Cross-sector Impact of Industry 4.0 on Jobs

Several studies conclude that more routine and manual tasks which are less cognitive in nature, and therefore considered 'low-skill' (for example, data entry and operating machinery), are

more likely to be automated. Jobs with 'predictable physical activities' are more likely to be automated in the short-term whereas jobs with a greater 'human element', which require relationship building, cognitive and social intelligence as well as complex interactions with other people (for example, education and healthcare), are less likely to be automated². Typically, the methodology employed by these studies is to break each occupation down into a set of tasks and estimate the share of tasks within an occupation or job profile that are likely to be automated. Based on this estimate of the share of tasks at risk of automation, the proportion of employment at risk (using labor force projections and the growth in industries and occupations) is projected. This can be converted into a number or share of all jobs or workers at risk of automation (or augmentation or addition).

The probability of automation of employment across sectors varies by country. Table 2 below illustrates the risk of automation for a few sectors, across developed and developing countries.

On average, by virtue of having a larger share of routine and predictable tasks, the impact

on manufacturing and agriculture is expected to be larger than the impact on services.

However, there are some sub-sectors in services such as hotels and hospitality or retail, which are likely to be amongst the most impacted as they have a large number of routine or predictable tasks such as cleaning and processing transactions. Services tend to have a higher number of tasks that require human interaction or cognition, and therefore are likely to be fully automated far slower, as the technology is still being developed.

Hence, it is important to note that every occupation, at all skill levels, is susceptible to automation, although the degree varies based on the proportion of routine or non-routine and manual or cognitive tasks. Industry 4.0 will therefore impact jobs across agriculture, manufacturing and services. There is a need to undertake a similar exercise for India; to estimate the impact of Industry 4.0 on jobs across sectors and develop scenarios. This is a critical input to help policymakers identify the sub-sectors more at risk in the short to medium term and focus long-term job creation strategies on those sectors and jobs at lower

TABLE 2 | Risk of Automation by Sector¹

Country	Manufacturing	Agriculture	Hotels and Restaurants	Administrative and Support Services
US	60%	58%	73%	39%
Thailand	65%	33%	85%	52%
Vietnam	74%	83%	93%	40%
Cambodia	75%	46%	73%	44%
Indonesia	56%	50%	78%	36%
The Philippines	46%	59%	68%	49%

Sources: ILO, MGI.

¹Given the differences across countries, and studies, in the definition of 'work' it is most useful to compare across sectors for a given country.

risk of automation. Furthermore, they need to ensure workforce readiness for the newer skills required and rapidly changing job profiles that will emerge as a result of automation.

To conclude, the risks and opportunities associated with the impact of automation on work are real and require immediate attention. Estimates may vary but they serve to provide a relative point of view on the sectors and job types that are more at risk. This report provides a perspective on how these risks can be addressed by availing of the opportunities that Industry 4.0 and digitization themselves present. In the Indian context, and that of other emerging economies, the services sector provides an excellent opportunity for growth and job creation. By harnessing technology as an enabler and ensuring that the appropriate learning and skilling ecosystem is in place to train job seekers in the newer skill profiles that will emerge, the 'growth without jobs' challenge can be effectively addressed.

NOTES

1. Research referred

- i) 'Speech by World Bank President Jim Yong Kim—The World Bank Group's Mission: To End Extreme Poverty', World Bank, 2016.
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 - iii) 'ASEAN in Transformation—The Future of Jobs at Risk of Automation', ILO, 2016.
 - iv) 'The Future of Employment: How Susceptible are Jobs to Computerisation?', Frey and Osborne, 2013.
 - v) 'Technology at Work v2.0', CITI GPS and Oxford Martin School, University of Oxford, 2016.
 - vi) 'Industry 4.0—The Future of Productivity and Growth in Manufacturing Industries', BCG, 2015.
 - vii) 'Man and Machine in Industry 4.0: How Will Technology Transform the Industrial Workforce Through 2025?', BCG, 2015.
 - viii) 'The Future of Work in Australia', BCG, unpublished.
 - ix) 'The Future of Work in the Developing World', Brookings Blum Roundtable, Post-Conference Report, 2016.
2. 'The Future of Employment: How Susceptible are Jobs to Computerisation?', Frey and Osborne, 2013; scientists believe that with evolution in technologies and big data and analytics, more cognitive tasks will also become more susceptible to automation. Advances in Artificial Intelligence (AI) will allow for more impartial outcomes, not affected by human emotions and judgment.

LIST OF ABBREVIATIONS

AI	: Artificial Intelligence
API	: Application Programming Interface
ASEAN	: Association of South East Asian Nations
BCG	: The Boston Consulting Group
CAGR	: Compound Annual Growth Rate
CII	: Confederation of Indian Industry
DIPP	: Department of Industrial Policy and Promotion
EU	: European Union
FDI	: Foreign Direct Investment
FTE	: Full-time Equivalent Employment
GATT	: General Agreement on Tariffs and Trade
GDP	: Gross Domestic Product
GE	: General Electric
GVA	: Gross Value Added
ILO	: International Labor Organization
INR	: Indian Rupees
IoT	: Internet of Things
IRENA	: International Renewable Energy Agency
ITeS	: Information Technology enabled Services
JAM	: Jan Dhan, Aadhaar and Mobile
MGI	: McKinsey Global Institute
MNC	: Multinational Corporation
MSME	: Micro, Small and Medium Enterprises
NASSCOM	: National Association of Software and Services Companies
NDAI	: National Digital Authority of India
NPCI	: National Payments Corporation of India
NSSO	: National Sample Survey Organisation
OECD	: Organisation for Economic Co-operation and Development
SEL	: Social and Emotional Learning
TFP	: Total Factor Productivity
UIDAI	: Unique Identification Authority of India
UK	: United Kingdom
UNDP	: United Nations Development Program
UPI	: Unified Payments Interface
US	: United States
VC	: Venture Capital
WEF	: The World Economic Forum
WTO	: The World Trade Organization
YoY	: Year on Year

FOR FURTHER READING

Other relevant reports and articles published by or in association with The Boston Consulting Group that may be of interest to the reader.

Future of Jobs in India— Enterprises and Livelihoods

A report by the Confederation of Indian Industry in association with The Boston Consulting Group, December 2016

Weaving the Way: Breakout Growth Agenda for the Indian Apparel, Made-ups and Textile Industry

A report by The Boston Consulting Group in association with the Confederation of Indian Industry, November 2016

Tapping into the Transformative Power of Service 4.0

A Focus by The Boston Consulting Group, September 2016

Time to Accelerate in the Race Toward Industry 4.0

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Internet for All: A Framework for Accelerating Internet Access and Adoption

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Changing the Game in Industrial Goods Through Digital Services

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A report by The Boston Consulting Group, June 2014

The Evolution of a Twenty-First- Century Digital Classroom

An article by The Boston Consulting Group, April 2014

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Acknowledgements

This study was undertaken by The Boston Consulting Group (BCG) with support from the Confederation of Indian Industry (CII).

We would like to thank the following people for their invaluable insights and feedback on this report: Nandan Nilekani, Sanjay Purohit and Shankar Maruwada from Ek-Step Foundation; Ramesh Abhishek and all the participants at a workshop organized by DIPP; Arun Maira, Senior Advisor, BCG; Hans-Paul Buerkner, Chairman, BCG and Vincent Chin, Senior Partner and Managing Director, BCG.

Special thanks to Jamshyd N Godrej, Naushad Forbes and Chandrajit Banerjee for their ideas and time.

We gratefully acknowledge the contribution of Richa Srivastava and Shreysi Mehendiratta from BCG's Mumbai office and Anchal Kakkar, Pawas Shrivastava and Radhika Katyal from BCG's New Delhi office for their contribution in writing this report.

Special thanks to Jasmin Pithawala and Maneck Katrak for managing the marketing process, and Jamshed Daruwalla, Pradeep Hire and Abbasali Asamdi for their contributions to the editing, designing and production of this report.

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