

## ANALYSIS

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# China's Provincial Economies: Growing Together or Pulling Apart?

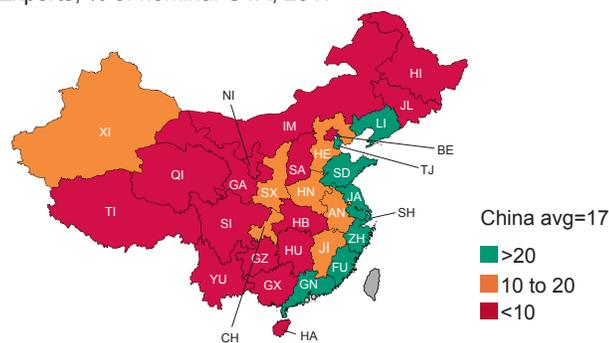
## Introduction

Over the past decade, China's inland provinces have begun to narrow the gaps in output, incomes and productivity with their more dynamic coastal peers, but with economic growth slowing across China's provincial economies, this period of convergence has come to a close. In this paper, we examine regional patterns of economic growth across China's provinces, comparing changes in industrial structure, productivity growth and demographics. While large investments in manufacturing, infrastructure and resource extraction helped narrow inland provinces' overall gap with the coast, the growing prominence of services—particularly high-tech service industries—will shift the locus of China's growth back to its coastal provinces.



## Chart 2: East, Center Power Export Thrust

Exports, % of nominal GVA, 2017



Sources: NBS, Moody's Analytics

other industries, economic drivers are diverse across regions. High-tech manufacturing and tech-related services predominate in the East, while more labor-intensive manufacturing industries and agriculture, energy and resource extraction anchor the Center and West.

The East remains China's economic locomotive. Although its provincial economies have grown more slowly than those of the Center and West for most of the past decade, the 10 eastern provinces make up more than half of China's GDP despite being home to just over a third of its population (see Tables 2 and 3). The East region encompasses Beijing and all of China's east coast provinces with the exception of Liaoning, which covers a small stretch of China's coast just north of Hebei. Together, the East's 10 provinces rank as the world's third largest economy, behind only the U.S. and China itself.

## Chart 3: Coastal Provinces Magnetize FDI

Foreign direct investment, % of nominal GVA, 2016



Sources: NBS, Moody's Analytics

Although the industrial composition of the East has shifted toward services, manufacturing still accounts for a very high share of economic activity. Eastern provinces also account for the overwhelming share of China's exports and rely more on trade than any other region (see Chart 2).

Although manufacturers have scrambled to set up facilities in China's Center and West, where land and labor costs are cheaper, factories in the East still churn out more than 80% of China's goods exports.

Despite differences in size and geographic location, almost all of China's eastern provinces played a leading role in China's rise as a global manufacturing powerhouse. Manufacturing behemoth Guangdong, whose early growth was stirred by its proximity to Hong Kong and access to foreign capital, remains China's largest provincial economy and is the origin of one-third of China's goods exports. However, the eastern provinces of Fujian, Zhejiang, Jiangsu and Shandong are also manufacturing heavyweights; their diverse manufacturing industries account for more than half of the East's exports and span consumer electronics, personal computers and IT equipment, household appliances, petrochemicals, and pharmaceuticals.

While manufacturing is a secondary driver in Shanghai and Beijing, where financial services and the public sector make up an outside share of the economy, China's financial and political capitals are export giants in their own right: The nominal value of their combined exports nearly exceeds that of India. And despite recent growth in

Table 1: Province Abbreviations

| <i>East</i>      |                |
|------------------|----------------|
| BE               | Beijing        |
| FU               | Fujian         |
| GN               | Guangdong      |
| HA               | Hainan         |
| HE               | Hebei          |
| JA               | Jiangsu        |
| SD               | Shandong       |
| SH               | Shanghai       |
| TJ               | Tianjin        |
| ZH               | Zhejiang       |
| <i>Center</i>    |                |
| AN               | Anhui          |
| HB               | Hubei          |
| HN               | Henan          |
| HU               | Hunan          |
| JJ               | Jiangxi        |
| SX               | Shanxi         |
| <i>West</i>      |                |
| CH               | Chongqing      |
| GA               | Gansu          |
| GX               | Guangxi        |
| GZ               | Guizhou        |
| IM               | Inner Mongolia |
| NI               | Ningxia        |
| QI               | Qinghai        |
| SA               | Shaanxi        |
| SI               | Sichuan        |
| TI               | Tibet          |
| XI               | Xinjiang       |
| YU               | Yunnan         |
| <i>Northeast</i> |                |
| HI               | Heilongjiang   |
| JL               | Jilin          |
| LI               | Liaoning       |

Source: Moody's Analytics

exports in the inland provinces of Henan, Sichuan and Chongqing, the East still draws more than three-quarters of China's total foreign direct investment (see Chart 3).

While external demand and global connections were instrumental to the East's ascent, the birth of high-tech service indus-

Table 2: Gross Value Added

## Compound annual growth rate

| Province          | 1995-2000 | Rank | 2000-2005 | Rank | 2005-2010 | Rank | 2010 to 2015 | Rank | 2015-2018 | Rank |
|-------------------|-----------|------|-----------|------|-----------|------|--------------|------|-----------|------|
| <b>East</b>       | 10.4      |      | 12.4      |      | 10.8      |      | 7.1          |      | 6.8       |      |
| BE Beijing        | 14.9      | 1    | 14.5      | 3    | 9.1       | 28   | 5.7          | 30   | 7.3       | 17   |
| FU Fujian         | 10.3      | 7    | 8.8       | 28   | 11.8      | 10   | 8.8          | 12   | 8.6       | 8    |
| GN Guangdong      | 10.6      | 6    | 12.2      | 10   | 10.5      | 21   | 6.7          | 24   | 7.4       | 16   |
| HA Hainan         | 5.3       | 30   | 8.3       | 31   | 11.2      | 16   | 7.6          | 21   | 7.5       | 13   |
| HE Hebei          | 10.2      | 8    | 11.6      | 13   | 10.1      | 26   | 6.6          | 25   | 3.2       | 27   |
| JA Jiangsu        | 9.4       | 17   | 12.4      | 9    | 11.8      | 11   | 7.7          | 19   | 6.8       | 20   |
| SD Shandong       | 9.0       | 20   | 12.9      | 7    | 11.5      | 14   | 7.6          | 22   | 7.1       | 19   |
| SH Shanghai       | 13.3      | 3    | 11.4      | 14   | 9.0       | 30   | 5.7          | 31   | 6.5       | 21   |
| TJ Tianjin        | 11.4      | 5    | 13.8      | 5    | 14.3      | 2    | 10.5         | 3    | 5.0       | 24   |
| ZH Zhejiang       | 10.0      | 10   | 14.6      | 2    | 10.2      | 25   | 6.3          | 27   | 7.5       | 14   |
| <b>Center</b>     | 9.1       |      | 10.7      |      | 11.3      |      | 8.3          |      | 7.3       |      |
| AN Anhui          | 8.3       | 27   | 10.2      | 19   | 11.8      | 12   | 8.9          | 9    | 8.9       | 7    |
| HB Hubei          | 8.7       | 22   | 9.9       | 23   | 12.0      | 8    | 8.9          | 11   | 7.6       | 12   |
| HN Henan          | 9.6       | 16   | 11.3      | 15   | 11.1      | 17   | 7.7          | 20   | 7.2       | 18   |
| HU Hunan          | 9.1       | 19   | 9.4       | 26   | 11.8      | 9    | 8.6          | 15   | 5.2       | 23   |
| JI Jiangxi        | 9.3       | 18   | 11.0      | 17   | 11.4      | 15   | 8.6          | 14   | 8.0       | 11   |
| SX Shanxi         | 9.8       | 13   | 13.9      | 4    | 9.1       | 29   | 6.1          | 28   | 8.0       | 10   |
| <b>West</b>       | 8.7       |      | 11.0      |      | 11.9      |      | 9.1          |      | 7.0       |      |
| CH Chongqing      | 8.6       | 24   | 11.1      | 16   | 13.2      | 4    | 10.9         | 1    | 6.4       | 22   |
| GA Gansu          | 12.9      | 4    | 9.7       | 25   | 9.5       | 27   | 8.7          | 13   | 8.3       | 9    |
| GX Guangxi        | 4.9       | 31   | 10.8      | 18   | 12.2      | 6    | 8.2          | 17   | 4.3       | 25   |
| GZ Guizhou        | 8.6       | 25   | 9.9       | 22   | 10.3      | 24   | 10.6         | 2    | 9.5       | 3    |
| IM Inner Mongolia | 10.2      | 9    | 16.4      | 1    | 15.5      | 1    | 8.2          | 16   | -0.9      | 30   |
| NI Ningxia        | 9.6       | 15   | 12.4      | 8    | 10.8      | 20   | 8.0          | 18   | 9.4       | 4    |
| QI Qinghai        | 7.6       | 29   | 12.0      | 11   | 10.9      | 18   | 8.9          | 7    | 3.7       | 26   |
| SA Shaanxi        | 9.8       | 12   | 11.7      | 12   | 12.5      | 5    | 9.2          | 6    | 9.8       | 2    |
| SI Sichuan        | 8.6       | 26   | 10.0      | 21   | 11.7      | 13   | 8.9          | 8    | 9.0       | 6    |
| TI Tibet          | 14.3      | 2    | 12.9      | 6    | 10.8      | 19   | 9.8          | 4    | 9.2       | 5    |
| XI Xinjiang       | 8.7       | 23   | 10.1      | 20   | 9.0       | 31   | 8.9          | 10   | 10.1      | 1    |
| YU Yunnan         | 9.7       | 14   | 8.5       | 29   | 10.3      | 22   | 9.2          | 5    | 7.5       | 15   |
| <b>Northeast</b>  | 8.8       |      | 8.9       |      | 11.8      |      | 6.5          |      | 0.5       |      |
| HI Heilongjiang   | 7.9       | 28   | 9.0       | 27   | 10.3      | 23   | 6.4          | 26   | 2.9       | 28   |
| JL Jilin          | 9.8       | 11   | 9.8       | 24   | 13.2      | 3    | 7.5          | 23   | 2.8       | 29   |
| LI Liaoning       | 8.9       | 21   | 8.4       | 30   | 12.1      | 7    | 6.0          | 29   | -2.0      | 31   |
| <b>National</b>   | 8.6       |      | 9.8       |      | 11.3      |      | 7.9          |      | 6.7       |      |

Rank is out of 31 provinces

Sources: NBS, Moody's Analytics

Table 3: Employment

## Compound annual growth rate

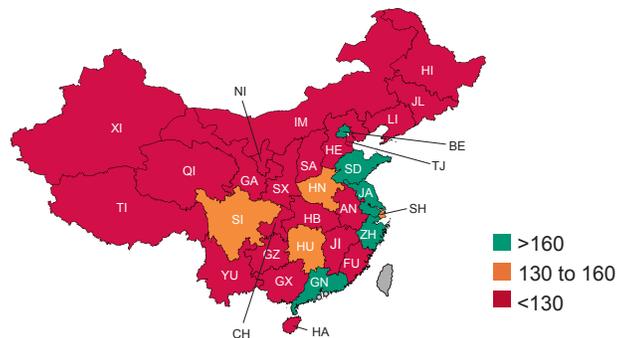
| Province          | 1995-2000 | Rank | 2000-2005 | Rank | 2005-2010 | Rank | 2010 to 2015 | Rank | 2015-2018 | Rank |
|-------------------|-----------|------|-----------|------|-----------|------|--------------|------|-----------|------|
| <i>East</i>       | 1.8       |      | 2.2       |      | 1.8       |      | 1.0          |      | -0.0      |      |
| BE Beijing        | 2.6       | 12   | 5.8       | 2    | 2.7       | 3    | -0.1         | 19   | 2.1       | 1    |
| FU Fujian         | 4.4       | 2    | 5.7       | 3    | 2.5       | 4    | 2.9          | 5    | 1.4       | 3    |
| GN Guangdong      | 2.9       | 7    | 4.6       | 4    | 2.5       | 5    | 0.4          | 15   | 0.6       | 7    |
| HA Hainan         | -0.3      | 24   | 1.0       | 11   | -0.5      | 17   | -0.2         | 20   | -0.2      | 22   |
| HE Hebei          | 1.4       | 16   | -0.6      | 23   | -1.3      | 22   | 1.1          | 10   | -0.2      | 19   |
| JA Jiangsu        | 0.7       | 19   | -1.3      | 28   | 1.8       | 9    | 0.4          | 13   | -1.4      | 30   |
| SD Shandong       | 3.9       | 5    | 3.2       | 5    | 0.2       | 13   | -0.7         | 24   | -0.2      | 21   |
| SH Shanghai       | -1.9      | 28   | -0.3      | 21   | 1.0       | 11   | 6.2          | 1    | -0.3      | 23   |
| TJ Tianjin        | -1.5      | 27   | 0.1       | 17   | -1.3      | 23   | 3.6          | 4    | 0.5       | 11   |
| ZH Zhejiang       | 0.9       | 17   | 6.8       | 1    | 9.3       | 1    | 2.4          | 6    | -0.2      | 20   |
| <i>Center</i>     | 1.5       |      | -0.0      |      | -0.4      |      | 0.8          |      | 0.7       |      |
| AN Anhui          | 1.8       | 15   | -1.6      | 29   | -0.3      | 15   | 0.3          | 16   | 0.2       | 14   |
| HB Hubei          | 0.1       | 22   | -0.1      | 19   | -2.5      | 30   | 0.7          | 12   | 1.0       | 5    |
| HN Henan          | 4.0       | 3    | 1.3       | 9    | -0.7      | 21   | 1.2          | 9    | 1.5       | 2    |
| HU Hunan          | 0.7       | 20   | -0.9      | 24   | 2.3       | 6    | -1.1         | 25   | -0.6      | 27   |
| JI Jiangxi        | -0.4      | 25   | -0.4      | 22   | -0.7      | 20   | 4.8          | 2    | 1.2       | 4    |
| SX Shanxi         | 1.8       | 14   | 1.2       | 10   | -0.4      | 16   | -2.0         | 28   | -0.4      | 25   |
| <i>West</i>       | 1.8       |      | 0.5       |      | 0.1       |      | -0.1         |      | 0.3       |      |
| CH Chongqing      | -0.2      | 23   | 1.4       | 8    | 1.4       | 10   | 4.3          | 3    | 0.4       | 13   |
| GA Gansu          | 1.8       | 13   | 0.7       | 12   | -1.9      | 27   | -0.6         | 23   | -0.5      | 26   |
| GX Guangxi        | 2.7       | 10   | 0.5       | 14   | -0.0      | 14   | -0.4         | 21   | 0.6       | 8    |
| GZ Guizhou        | 2.9       | 8    | 2.8       | 6    | -0.6      | 19   | 2.1          | 7    | 0.9       | 6    |
| IM Inner Mongolia | -0.9      | 26   | -0.3      | 20   | -1.6      | 26   | -2.0         | 27   | -0.1      | 17   |
| NI Ningxia        | 3.3       | 6    | 0.3       | 16   | -2.3      | 28   | 0.4          | 14   | -0.1      | 18   |
| QI Qinghai        | 0.5       | 21   | -1.3      | 27   | 1.8       | 8    | -0.5         | 22   | 0.5       | 10   |
| SA Shaanxi        | 2.8       | 9    | 1.9       | 7    | -0.5      | 18   | 0.0          | 18   | 0.1       | 16   |
| SI Sichuan        | 0.8       | 18   | 0.1       | 18   | 0.3       | 12   | -2.5         | 29   | 0.2       | 15   |
| TI Tibet          | 6.2       | 1    | 0.6       | 13   | 2.0       | 7    | 1.7          | 8    | -0.3      | 24   |
| XI Xinjiang       | 2.7       | 11   | 0.4       | 15   | -1.4      | 24   | 0.0          | 17   | 0.5       | 9    |
| YU Yunnan         | 3.9       | 4    | -1.2      | 26   | 3.2       | 2    | 0.9          | 11   | 0.5       | 12   |
| <i>Northeast</i>  | -3.2      |      | -1.9      |      | -2.3      |      | -3.1         |      | -2.0      |      |
| HI Heilongjiang   | -2.3      | 29   | -1.0      | 25   | -3.3      | 31   | -4.8         | 31   | -1.0      | 29   |
| JL Jilin          | -2.4      | 30   | -2.5      | 31   | -2.4      | 29   | -2.8         | 30   | -0.6      | 28   |
| LI Liaoning       | -4.3      | 31   | -2.3      | 30   | -1.5      | 25   | -2.0         | 26   | -3.5      | 31   |
| <i>National</i>   | 1.2       |      | 0.7       |      | 0.4       |      | 0.4          |      | 0.2       |      |

Rank is out of 31 provinces

Sources: NBS, Moody's Analytics

## Chart 4: Tech Clusters Flourish in the East

Software and information transmission GVA, 2015CNY bil, 2018



Sources: NBS, Moody's Analytics

tries in the eastern provinces of Guangdong, Beijing, Zhejiang and Shanghai owes to more recent growth in internal demand. As productivity gains in eastern factories spilled into manufacturing wages and Chinese workers gradually gained the buying power to purchase the fruits of their labor, newly sprouted firms in e-commerce, information technology and digital entertainment granted them unprecedented choice over where and how to do so. While China's high-tech manufacturers are still climbing the value-added chain, domestic tech firms geared toward consumer-oriented services and internet connectivity have risen to global prominence and now rival U.S. tech titans in revenue and global influence.

Guangdong is the cradle of China's high-tech revolution, and Shenzhen, its largest city, is its spark. Shenzhen's sheer size, proximity to global investors in neighboring Hong Kong, and early designation as a special economic zone—which warranted increased autonomy for private firms—contributed to the ascent of home-grown tech titans Tencent, ZTE and Huawei. Recent growth in informatics, cloud computing, mobile software and artificial intelligence has swelled the ranks of top Chinese and global tech firms operating in Shenzhen and has created positive spillovers to other cities in Guangdong. Guangdong capital Guangzhou is one such example. Thanks to its proximity to Shenzhen and lower land and labor costs relative to Shenzhen, the city of Guangzhou has gained traction as a hub for Chinese tech startups.

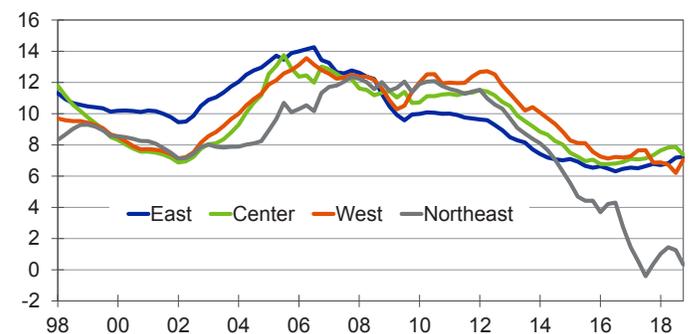
Tech in China is hardly a Guangdong story alone. Indeed, the total gross value added by software and information technology firms in Beijing is almost as high as that of tech firms in Guangdong (see Chart 4). Over the past decade, high-tech firms in Beijing and other eastern provinces have emerged as serious global contenders in both consumer-oriented and business services. For example, Zhejiang capital Hangzhou is home to e-commerce and internet titan Alibaba and boasts a vibrant ecosystem of internet startups, while tech firms in Beijing cater to a diverse range of digital consumers, from ride-hailing app Chuxing to microblog Sina Weibo and search engine and artificial intelligence firm Baidu.

With the exception of Sichuan province and, in particular, its tech-fueled capital Chengdu, high-tech service industries in China's Center and West are still in early innings. Rather, rapid growth in manufacturing and greater investment in resource-rich provinces were the primary forces powering faster growth in China's interior in the 10 years from 2005 to 2015; China's inland and eastern provinces have since slowed and are now growing at similar rates (see Chart 5).

The rapid rise in manufacturing wages and land costs in China's East was the catalyst for manufacturers' inland march. With nationwide manufacturing wages—a close proxy for wage rates in the East—increasing by a factor of three in the 1990s alone, plans to move factories to China's interior surfaced not long after the country's entry into the World Trade Organization in 2001. Although labor-intensive manufacturing firms were the

## Chart 5: Center, West Outpace East...

GVA, 2015CNY, % change yr ago, 12-qtr MA



Sources: NBS, Moody's Analytics

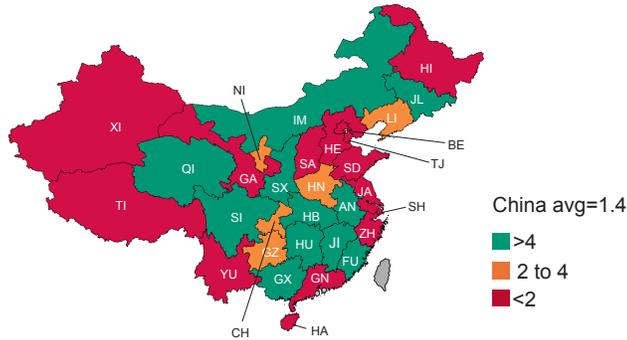
first to push inland, high-tech manufacturing industries were soon to follow, with electronics manufacturing giant Foxconn, chipmaker Intel, and personal computer giant Hewlett-Packard cutting the ribbon on factories in Henan, Sichuan and Chongqing, respectively, by the decade's end.

The central provinces of Henan and Anhui, which sit adjacent to China's eastern provinces and boast shorter transportation times to east coast ports relative to other central provinces and China's West, were the first to attract manufacturers inland. However, manufacturing investment also poured into the western provinces of Sichuan and Chongqing. Though more distant from major shipping routes, the two provinces were successful in revamping factories from China's earlier period of state-led industrialization, which channeled capital into the country's interior. The combination of large industrial facilities and a more qualified labor force—a legacy of China's earlier inward-led industrialization—proved a powerful draw for global manufacturers seeking to cut costs. Chongqing now counts as China's largest manufacturer of laptop computers and is also the largest producer of laptops globally, while factories in Sichuan are among China's largest producers of microchips. The opening of an overland rail route from Chongqing to Germany in 2010 did not hurt, with provincial exports from Chongqing and Sichuan increasing by a factor of three following the route's completion.

While the influx of manufacturing investment over the past two decades was concentrated in a handful of central and western

### Chart 6: ...As Factories Move Inland...

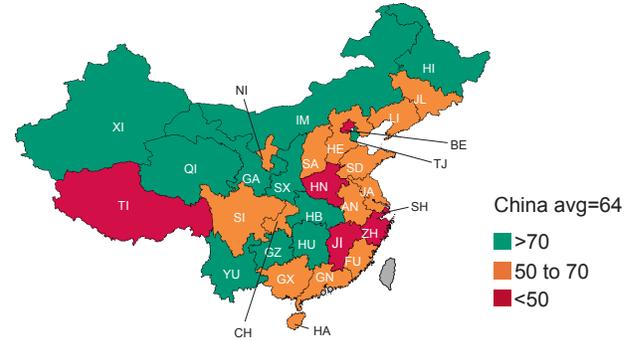
Manufacturing share of total GVA, change, ppt, 2005 to 2015



Sources: NBS, Moody's Analytics

### Chart 7: ...And Commodity Hubs Thrive

Primary industries' GVA, % change, 2005 to 2015



Sources: NBS, Moody's Analytics

provinces, growth in industrial production and exports recast the two regions' industrial base in the image of the East, putting goods-producing industries at the center of inland economies. In the 10 years from 2005 to 2015, manufacturing's share of total gross value added rose by an average of 10 percentage points in the Center and by 8 in the West (see Chart 6). While manufacturers such as Foxconn, Intel, Samsung and Dell clustered in just a few inland provinces, the hunt for ever-cheaper sources of labor stretched supply chains farther south and west, increasing the importance of manufacturing in the rural provinces of Hunan, Hubei and Guangxi.

China's inland provinces also benefited from the country's growing appetite for commodities. China's six central provinces, which together account for the bulk of the country's grain and livestock production, reaped benefits from large investments in farm machinery and mechanization. However,

mineral-rich provinces in the West saw the largest gains (see Chart 7). The near tripling of global oil prices from 2005 to mid-2014 and the rapid rise in domestic natural gas prices ratcheted up growth in the oil- and gas-rich provinces of Xinjiang, Gansu and Qinghai. Meanwhile, the explosion in global demand for lithium-ion batteries and the race to produce ever-smaller microchips sent prices for rare earth elements soaring, catapulting growth in resource-rich Inner Mongolia into double digits. The province boasts some of the world's largest reserves of rare earths. Although commodity-rich central and western provinces slowed substantially following the global collapse in commodity prices in late 2014, nascent manufacturing industries acted as shock absorbers, helping to stabilize their economies until commodity prices recovered.

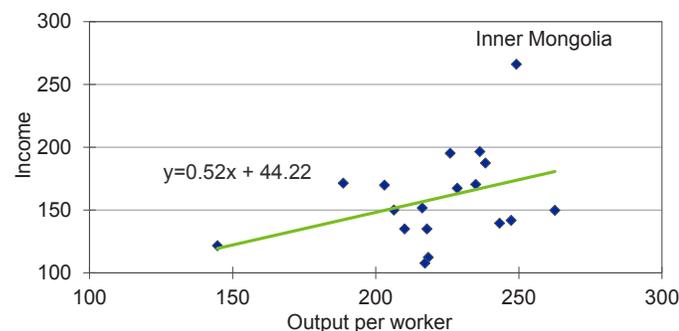
Not only did the influx of investment in farms, mines and manufacturing centers

hoist productivity, but gains in per-worker output spilled into incomes and wages (see Chart 8). The pass-through from productivity to incomes was especially high in Inner Mongolia, where initial incomes and productivity were very low relative to China's other provinces before the decadelong surge in mining investment. The increase in productivity and, ultimately, purchasing power gave manufacturers further impetus to locate factories and distribution centers inland, where firms could tap into demand from a large and increasingly prosperous consumer class.

Disposable incomes over the past decade not only rose in the absolute but increased relative to China's more prosperous East as well. After falling through the early 2000s, the ratio of per capita disposable incomes in the Center and West relative to the East rose by an average of 5 percentage points between 2005 and 2015 (see Chart 9). Both

### Chart 8: Productivity Gains Lift Incomes...

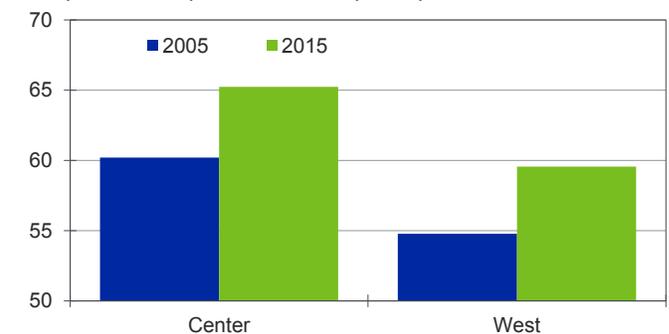
% change, 2005 to 2015, Center and West



Sources: NBS, Moody's Analytics

### Chart 9: ...And Narrow Gap With East

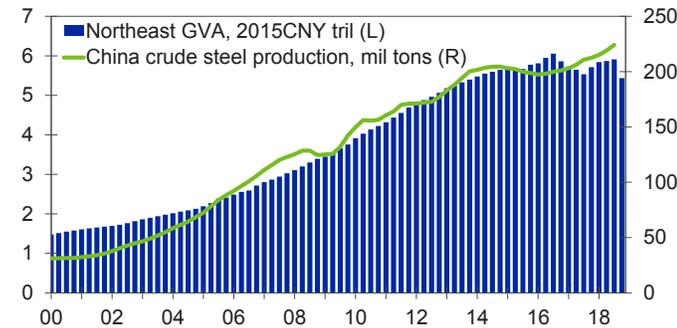
Total personal disposable income per capita, % of East



Sources: NBS, Moody's Analytics

### Chart 10: Overcapacity Ails the Northeast

4-qtr MA



Sources: NBS, World Steel Assn., Moody's Analytics

### Chart 11: Northeast Industries Pack Heavy

Heavy industry, volume, % of national total, 2016



Sources: NBS, Moody's Analytics

per-worker output and wages saw similar gains relative to eastern provinces.

Growth in output, incomes and wages did not extend to China's Northeast, which has suffered from almost a decade of economic stagnation. China's Northeast provinces were among the first to industrialize, with large endowments of iron, coal and petroleum making them the focal point of state-led industrialization efforts in the 1960s and 1970s. However, reliance on fabricated metals, machinery, and other heavy industrial goods—the demand for which peaked early last decade both internally and globally—has caused growth to slow dramatically. The province of Liaoning, the region's largest in terms of both population and GDP and the heart of the region's steel-making and machinery industries, has only recently emerged from a two-year recession despite provincial government efforts to revive growth.

While Liaoning sits at the heart of the Northeast's steel industry, all three Northeast provinces are important steelmaking centers. As such, their economies have been especially sensitive to local producers' efforts to curtail supply amid a global steel glut and the imposition of U.S. tariffs on aluminum and steel (see Chart 10). Reliance on state investment has also kept the Northeast from pivoting away from heavy industries and toward faster-growing electronics, biotech, and advanced materials sectors (see Chart 11). Although provinces in the East are also important producers of machinery and industrial goods, heavy industry remains

highly concentrated in the Northeast despite wilting returns at both private and state-owned firms.

Older, asset-heavy state enterprises make up an outsize share of the Northeast's industrial base, and the health of both machinery and consumer-oriented industries such as autos has deteriorated as other central and western provinces such as Hunan and Chongqing claim a larger share of China's internal vehicle and auto parts market and increase expenditures on research and development.

#### Dueling dragons: Demographics and productivity

Although China's central and western provinces grew faster than the East for much of the past decade, the rise of high-value service industries in the East has opened a slight lead in productivity growth. However, a contracting labor force—the product of declining birthrates and smaller inflows of rural migrants from China's central and western provinces—has taken a bite out of total economic growth, erasing what would have otherwise been a significant lead in economic growth over China's other regions.

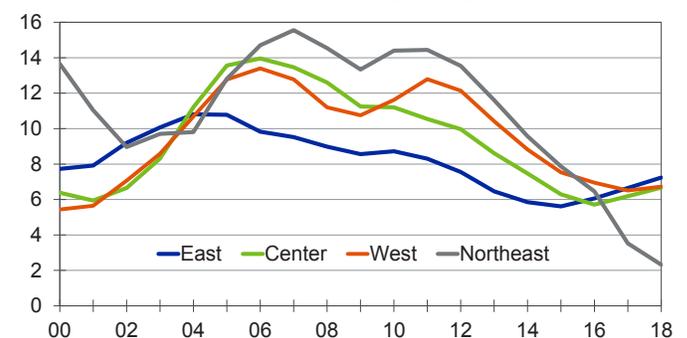
China's central and western provinces are aging rapidly as

well. While the outflow of migrants from China's central and western provinces has slowed, the sharp decline in birthrates over the past two decades has slowed growth in younger cohorts and pulled down population growth across regions (see Table 4). This sweeping shift in the age structure of the population has brought labor force gains to a near halt and will shift the burden of future economic growth to gains in productivity. However, with investment in manufacturing and resource extraction yielding ever smaller returns, and competition from low-cost manufacturers in Southeast Asia attracting capital abroad, future gains will be harder to come by. And while productivity growth has recently accelerated slightly in all regions save the Northeast, gains remain well below those reached at the height of China's 2005 to 2015 economic boom (see Chart 12).

For most of the past two decades, labor force and productivity growth worked

### Chart 12: Productivity Growth Downshifts

Output per worker, 2015CNY, % change yr ago, 3-yr MA



Sources: NBS, Moody's Analytics

Table 4: Population

## Compound annual growth rate

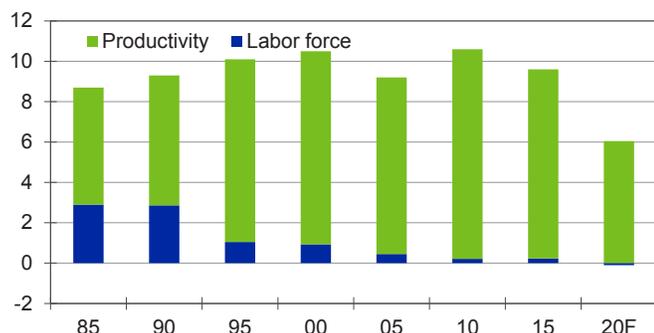
| Province          | 1995-2000 | Rank | 2000-2005 | Rank | 2005-2010 | Rank | 2010 to 2015 | Rank | 2015-2018 | Rank |
|-------------------|-----------|------|-----------|------|-----------|------|--------------|------|-----------|------|
| <b>East</b>       | 1.1       |      | 1.0       |      | 1.7       |      | 0.7          |      | 0.6       |      |
| BE Beijing        | 2.0       | 3    | 2.5       | 2    | 5.0       | 1    | 2.0          | 2    | -0.2      | 29   |
| FU Fujian         | 1.1       | 10   | 0.8       | 13   | 0.7       | 16   | 0.8          | 11   | 0.4       | 19   |
| GN Guangdong      | 2.5       | 1    | 1.4       | 9    | 2.7       | 4    | 0.8          | 12   | 1.0       | 3    |
| HA Hainan         | 1.3       | 7    | 1.4       | 8    | 1.4       | 8    | 1.0          | 7    | 0.6       | 10   |
| HE Hebei          | 0.6       | 21   | 0.5       | 19   | 1.0       | 13   | 0.6          | 14   | 0.4       | 21   |
| JA Jiangsu        | 0.7       | 15   | 0.7       | 14   | 0.8       | 15   | 0.3          | 27   | 0.2       | 26   |
| SD Shandong       | 0.4       | 23   | 0.5       | 18   | 0.7       | 19   | 0.5          | 17   | 0.8       | 5    |
| SH Shanghai       | 2.2       | 2    | 3.0       | 1    | 3.9       | 3    | 1.0          | 6    | -0.1      | 28   |
| TJ Tianjin        | 0.8       | 14   | 1.0       | 12   | 4.6       | 2    | 3.6          | 1    | 0.6       | 12   |
| ZH Zhejiang       | 1.1       | 9    | 1.5       | 7    | 1.9       | 5    | 0.3          | 22   | 0.7       | 7    |
| <b>Center</b>     | 0.4       |      | 0.2       |      | 0.4       |      | 0.4          |      | 0.4       |      |
| AN Anhui          | 0.4       | 24   | 0.4       | 23   | -0.2      | 28   | 0.6          | 15   | 0.6       | 11   |
| HB Hubei          | 0.6       | 18   | -0.3      | 29   | -0.5      | 30   | 0.4          | 20   | 0.4       | 20   |
| HN Henan          | 0.3       | 25   | 0.2       | 27   | 0.4       | 24   | 0.2          | 28   | 0.3       | 23   |
| HU Hunan          | -0.0      | 31   | -0.4      | 30   | 1.1       | 12   | 0.6          | 13   | 0.4       | 18   |
| JI Jiangxi        | 0.6       | 20   | 1.0       | 10   | 0.9       | 14   | 0.5          | 19   | 0.5       | 16   |
| SX Shanxi         | 0.9       | 11   | 0.6       | 15   | 1.3       | 9    | 0.5          | 18   | 0.3       | 24   |
| <b>West</b>       | 0.6       |      | 0.3       |      | 0.3       |      | 0.6          |      | 0.6       |      |
| CH Chongqing      | 0.1       | 30   | -1.0      | 31   | -0.1      | 27   | 0.9          | 8    | 1.0       | 4    |
| GA Gansu          | 0.9       | 13   | 0.2       | 25   | 0.1       | 26   | 0.3          | 25   | 0.3       | 22   |
| GX Guangxi        | 0.2       | 29   | 0.4       | 22   | 0.6       | 21   | 0.8          | 10   | 0.6       | 9    |
| GZ Guizhou        | 0.7       | 16   | 0.5       | 20   | -0.8      | 31   | 0.3          | 26   | 0.5       | 14   |
| IM Inner Mongolia | 0.6       | 19   | 0.4       | 21   | 0.7       | 17   | 0.3          | 23   | 0.2       | 25   |
| NI Ningxia        | 1.5       | 6    | 1.5       | 5    | 1.3       | 10   | 1.1          | 5    | 0.6       | 8    |
| QI Qinghai        | 0.9       | 12   | 1.7       | 3    | 1.4       | 7    | 0.9          | 9    | 0.6       | 13   |
| SA Shaanxi        | 0.5       | 22   | 0.6       | 17   | 0.5       | 23   | 0.3          | 24   | 0.5       | 17   |
| SI Sichuan        | 0.3       | 27   | -0.2      | 28   | -0.3      | 29   | 0.4          | 21   | 0.7       | 6    |
| TI Tibet          | 1.7       | 5    | 1.5       | 6    | 1.3       | 11   | 1.5          | 4    | 1.8       | 1    |
| XI Xinjiang       | 1.9       | 4    | 1.7       | 4    | 1.7       | 6    | 1.6          | 3    | 1.1       | 2    |
| YU Yunnan         | 1.2       | 8    | 1.0       | 11   | 0.7       | 20   | 0.6          | 16   | 0.5       | 15   |
| <b>Northeast</b>  | 0.4       |      | 0.3       |      | 0.5       |      | -0.0         |      | -0.2      |      |
| HI Heilongjiang   | 0.2       | 28   | 0.6       | 16   | 0.6       | 22   | -0.1         | 31   | -0.2      | 30   |
| JL Jilin          | 0.6       | 17   | 0.3       | 24   | 0.2       | 25   | 0.0          | 29   | -0.7      | 31   |
| LI Liaoning       | 0.3       | 26   | 0.2       | 26   | 0.7       | 18   | 0.0          | 30   | 0.0       | 27   |
| <b>National</b>   | 0.9       |      | 0.6       |      | 0.5       |      | 0.5          |      | 0.5       |      |

Rank is out of 31 provinces

Sources: NBS, Moody's Analytics

## Chart 13: From Dividend to Deficit

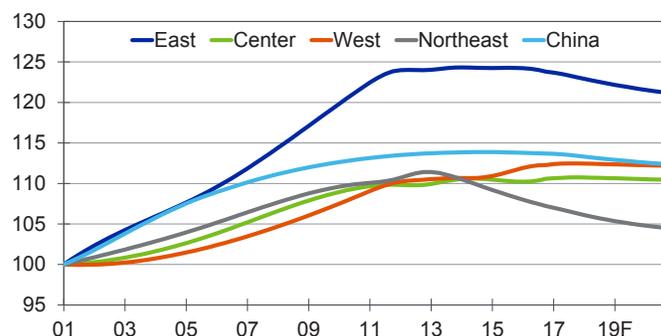
Components of GDP growth, %, 10-yr MA, China



Sources: NBS, Moody's Analytics

## Chart 14: Labor Constraints Loom Larger

Population age 15 to 64, 2002Q1=100



Sources: NBS, Moody's Analytics

in tandem, with the eastward shift of China's rural population helping to power faster productivity gains. As more of China's labor force migrated to urban areas and worked with ever-larger sums of capital, productivity growth surged. Meanwhile, higher wages beckoned successive generations of rural workers in China's Center and West to make the journey east. At the peak of the eastward migration wave in the mid-1990s, the economies of the eastern provinces grew twice as fast as those in the rest of the country.

The eastward shift of China's population magnified the East's demographic dividend—the boost to economic growth resulting from a large increase in the working-age population relative to young and old dependents. The large increase in China's working-age population, defined as ages 15 to 64, kept China's economy growing despite subdued productivity gains during the early periods of state-led industrialization. Indeed, as late as the mid-1980s, China derived almost a third of its total economic growth from growth in the labor force (see Chart 13). However, over the past decade, falling birthrates and the aging of the workforce have caused the working-age population to peak, making productivity gains the sole driver of economic growth.

The unwinding of China's demographic dividend poses an especially great challenge for the East, where the reduced inflow of rural migrants from China's inland provinces has compounded the demographic drag posed by an aging population. While internal

migration figures at the provincial level are hard to come by, natural growth—that is, the share of population growth stemming from the excess of births over deaths—has accounted for just one-third of total population gains from 2000 to 2015. This points to internal migration as the likely driver of the bulk of the region's population gains, a finding consistent with estimates of internal migration flows based on county and prefectural-level data.<sup>2</sup>

The influx of new migrants helped underwrite a massive increase in labor and thrift that would power the East's export boom. That the dependency ratio, or the share of young and old dependents to the working-age population, fell swiftly during this period was of no small injury either. The increase in the East's working-age population relative to other cohorts padded provincial government tax revenues and helped support infrastructure projects that sped eastern factories' access to railroads and ports.

However, the aging of China's baby boom generation—the cohort of Chinese born after the conclusion of the country's 1927-1950 civil war—caught up to the East especially quickly given lower historical birthrates relative to China's inland provinces. The slowdown in natural growth was compounded by a reversal in migration trends beginning in the mid-2000s, when factories in China's

interior began to purr. With fewer residents from central and western provinces leaving for the East and more residents returning, the working-age population in the East peaked by 2013, one year ahead of that of the nation as a whole (see Chart 14).

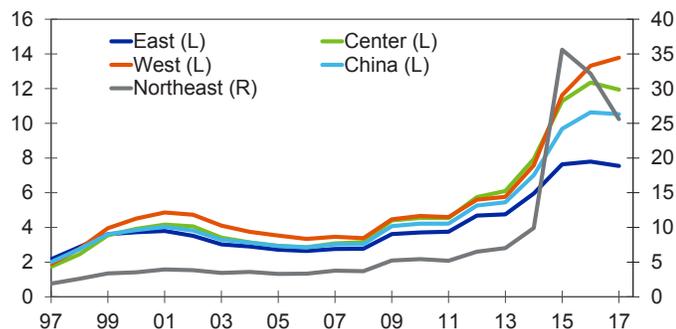
Meanwhile, China's Center and West, which suffered a demographic deficit throughout the 2000s from the out-migration of rural laborers, enjoyed a slight boost from their return: The working-age population in the Center and West has continued to grow, albeit at an ever-slower rate, through the first three quarters of 2018. However, the influx of return migrants will not be sufficient to offset demographic headwinds. The populations of central and western provinces are aging too, and the large shift in the age structure of the population will make for only marginal gains in the labor force through the end of this decade.

The demographics of China's Northeast were shaped by different dynamics. As China's first region to industrialize and cluster in urban centers, the Northeast experienced a more rapid decline in birthrates in the 1980s and 1990s and a smaller increase in its working-age cohort relative to other regions. Out-migration has further thinned the pool of potential workers, and its working-age population has fallen by close to one-sixth in the past five years alone. Because of higher initial wages and a declining working-age population, the Northeast has struggled to attract large manufacturing firms from the East, which instead migrated inland in a bid to lower costs. Demographic headwinds in

<sup>2</sup> See Kam Wing Chan, "Migration and Development in China: Trends, Geography and Current Issues," *Migration and Development* Volume 1, No. 2 (2012), and Anwaer Maimaitiming, Zhang Xiaolei, and Cao Huhua, "Urbanization in Western China," *Chinese Journal of Population Resources and Environment* Volume 11, No. 1 (2013).

## Chart 15: Returns on Capital Slide...

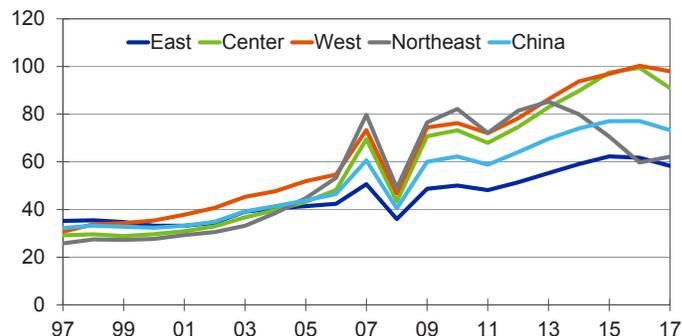
Incremental capital-output ratio



Sources: NBS, Moody's Analytics

## Chart 16: ...Despite Investment Surge

Fixed assets, % of nominal GVA



Sources: NBS, Moody's Analytics

the Northeast have curtailed productivity gains. Total employment has declined and output in the Northeast has barely increased in the past three years, causing output per worker to rise only marginally.

While demographic headwinds are blowing more briskly in the East, the rise of high-tech service industries will sustain faster productivity growth in the urban mega clusters of Shenzhen, Hangzhou, Shanghai and Beijing. However, whether these gains will radiate beyond city limits and elevate productivity growth at the provincial level is an open question. While productivity growth in the East has ticked up in recent years and holds a slight lead over China's Center and West, it is still a third below the boom years of 1995 to 2010, when manufacturing investment surged in the East and its factories' share of global exports tripled (see Table 5).

With China's share of global exports peaking and the value added by its manufacturing exports leveling off,<sup>3</sup> China's East now faces a productivity puzzle similar to that of more developed countries: how to bring productivity gains in software, information technology, artificial intelligence and robotics to bear in manufacturing and other service industries. While the meteoric rise of Chinese

tech giants Tencent, Alibaba and Baidu will support a vivid ecosystem of smaller and mid-size tech firms, tech's share of gross value added in the East is still small relative to the U.S., Europe and Asia. And while China's largest tech firms now rival their U.S. counterparts in revenue and market value, their revenue streams rely on a much larger customer base whose individuals hold just a fraction of the average U.S. consumer's purchasing power.

Indeed, outside of a select few urban centers, the East remains heavily reliant on manufacturing, where despite rapid growth, wages remain well below average compared with developed countries, placing a speed bump on consumption spending and revenue growth by China's consumer-oriented tech titans. Given the predominance of manufacturing in eastern provinces, it is hardly a surprise that the roots of the East's productivity slowdown lie not only in tamer growth in labor productivity but in sliding returns on capital as well. Common measures of capital efficiency such as the return on assets and the incremental capital-output ratio (ICOR)<sup>4</sup> have weakened substantially over the past decade, suggesting that the early gains from urbanization and physical capital accumulation in the East have already been tapped.

The swift rise in the ICOR testifies to the decline in returns on fixed investment. All else equal, an increase in the ICOR means

that more capital is required to generate each additional unit of output. The near doubling of the ICOR over the past decade in eastern provinces highlights the decline in capital efficiency: On average, firms require twice as much capital to generate an additional unit of output than they did 10 years back (see Chart 15). Provincial-level data on the return on assets of private and state-owned enterprises tell a similar story: The ratio of net income to total assets fell by one-fifth from 2010 to 2017, the last year of data.

If the East is plagued by capital fatigue, China's Center and West are panting. Returns to capital, as measured by the ICOR, fell by a factor of three in the last seven years through 2017, while the return on assets has nearly halved. The investment surge in the Center and West has caused the ratio of fixed assets to total provincial GDP to double (see Chart 16). The runup in investment and accompanying decline in returns will raise the cost of capital in the Center and West even if firms pony up the ever-larger sums needed to increase output. While more investment in the Center and West has poured into factories, farms and mines than into residential construction relative to the East, higher financing costs and guidance by the central government to tighten lending standards will weigh on investment, all of which suggests that the West and Center will be hard-pressed to match the East in productivity and overall economic growth.

While the East has retaken the lead in productivity growth for the past three years,

<sup>3</sup> China's share of global goods exports peaked in 2015 at 14.2% and has fallen in each of the past two years, according to global trade figures from the International Monetary Fund. The decline in China's share of total global exports continued through the first five months of 2018. According to the OECD, the value added by China's manufacturing exports rose 5 percentage points from 2000 to 2010, but was mostly unchanged through 2014, the last year of data.

<sup>4</sup> The incremental capital-output ratio is calculated as the change in investment divided by the change in total provincial GVA.

Table 5: Productivity

## Compound annual growth rate

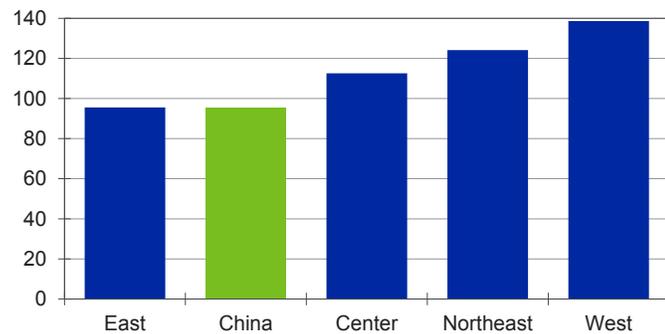
| Province          | 1995-2000 | Rank | 2000-2005 | Rank | 2005-2010 | Rank | 2010 to 2015 | Rank | 2015-2018 | Rank |
|-------------------|-----------|------|-----------|------|-----------|------|--------------|------|-----------|------|
| <b>East</b>       | 8.4       |      | 10.1      |      | 8.9       |      | 6.0          |      | 6.8       |      |
| BE Beijing        | 11.9      | 5    | 8.2       | 26   | 6.3       | 30   | 5.8          | 26   | 5.1       | 23   |
| FU Fujian         | 5.6       | 26   | 2.9       | 31   | 9.0       | 24   | 5.7          | 27   | 7.1       | 14   |
| GN Guangdong      | 7.5       | 19   | 7.3       | 28   | 7.7       | 28   | 6.3          | 25   | 6.8       | 17   |
| HA Hainan         | 5.7       | 25   | 7.2       | 29   | 11.8      | 13   | 7.8          | 19   | 7.8       | 11   |
| HE Hebei          | 8.7       | 12   | 12.3      | 7    | 11.5      | 16   | 5.4          | 28   | 3.4       | 28   |
| JA Jiangsu        | 8.6       | 13   | 13.9      | 2    | 9.8       | 21   | 7.3          | 21   | 8.3       | 10   |
| SD Shandong       | 4.9       | 30   | 9.4       | 24   | 11.3      | 18   | 8.3          | 15   | 7.3       | 13   |
| SH Shanghai       | 15.6      | 1    | 11.8      | 11   | 8.0       | 27   | -0.5         | 31   | 6.8       | 16   |
| TJ Tianjin        | 13.1      | 3    | 13.6      | 3    | 15.9      | 3    | 6.6          | 22   | 4.5       | 24   |
| ZH Zhejiang       | 9.0       | 10   | 7.4       | 27   | 0.8       | 31   | 3.9          | 29   | 7.7       | 12   |
| <b>Center</b>     | 7.5       |      | 10.7      |      | 11.8      |      | 7.4          |      | 6.6       |      |
| AN Anhui          | 6.4       | 22   | 12.0      | 10   | 12.1      | 10   | 8.6          | 11   | 8.6       | 7    |
| HB Hubei          | 8.5       | 14   | 10.0      | 17   | 14.8      | 4    | 8.1          | 16   | 6.5       | 19   |
| HN Henan          | 5.3       | 29   | 9.9       | 19   | 11.9      | 12   | 6.4          | 23   | 5.6       | 22   |
| HU Hunan          | 8.4       | 15   | 10.4      | 14   | 9.3       | 23   | 9.8          | 5    | 5.9       | 21   |
| JI Jiangxi        | 9.7       | 9    | 11.4      | 12   | 12.1      | 11   | 3.7          | 30   | 6.6       | 18   |
| SX Shanxi         | 7.9       | 16   | 12.6      | 5    | 9.5       | 22   | 8.3          | 12   | 8.4       | 9    |
| <b>West</b>       | 6.8       |      | 10.4      |      | 11.7      |      | 9.2          |      | 6.7       |      |
| CH Chongqing      | 8.8       | 11   | 9.6       | 23   | 11.6      | 15   | 6.3          | 24   | 5.9       | 20   |
| GA Gansu          | 10.9      | 7    | 9.0       | 25   | 11.6      | 14   | 9.4          | 7    | 8.8       | 5    |
| GX Guangxi        | 2.1       | 31   | 10.3      | 15   | 12.3      | 9    | 8.6          | 10   | 3.7       | 26   |
| GZ Guizhou        | 5.5       | 28   | 6.9       | 30   | 10.9      | 19   | 8.3          | 13   | 8.5       | 8    |
| IM Inner Mongolia | 11.2      | 6    | 16.7      | 1    | 17.4      | 1    | 10.4         | 4    | -0.8      | 31   |
| NI Ningxia        | 6.1       | 23   | 12.1      | 9    | 13.4      | 7    | 7.6          | 20   | 9.5       | 2    |
| QI Qinghai        | 7.0       | 20   | 13.4      | 4    | 8.9       | 25   | 9.5          | 6    | 3.1       | 29   |
| SA Shaanxi        | 6.9       | 21   | 9.7       | 21   | 13.1      | 8    | 9.2          | 8    | 9.6       | 1    |
| SI Sichuan        | 7.8       | 17   | 9.9       | 18   | 11.3      | 17   | 11.6         | 2    | 8.7       | 6    |
| TI Tibet          | 7.6       | 18   | 12.1      | 8    | 8.7       | 26   | 7.9          | 18   | 9.5       | 4    |
| XI Xinjiang       | 5.8       | 24   | 9.6       | 22   | 10.5      | 20   | 8.8          | 9    | 9.5       | 3    |
| YU Yunnan         | 5.6       | 27   | 9.8       | 20   | 6.9       | 29   | 8.3          | 14   | 7.0       | 15   |
| <b>Northeast</b>  | 12.4      |      | 11.0      |      | 14.5      |      | 9.9          |      | 2.5       |      |
| HI Heilongjiang   | 10.5      | 8    | 10.1      | 16   | 14.0      | 5    | 11.9         | 1    | 3.9       | 25   |
| JL Jilin          | 12.6      | 4    | 12.5      | 6    | 15.9      | 2    | 10.6         | 3    | 3.5       | 27   |
| LI Liaoning       | 13.9      | 2    | 11.0      | 13   | 13.8      | 6    | 8.1          | 17   | 1.5       | 30   |
| <b>National</b>   | 7.4       |      | 9.0       |      | 10.9      |      | 7.5          |      | 6.6       |      |

Rank is out of 31 provinces

Sources: NBS, Moody's Analytics

## Chart 17: Productivity Rises More Inland...

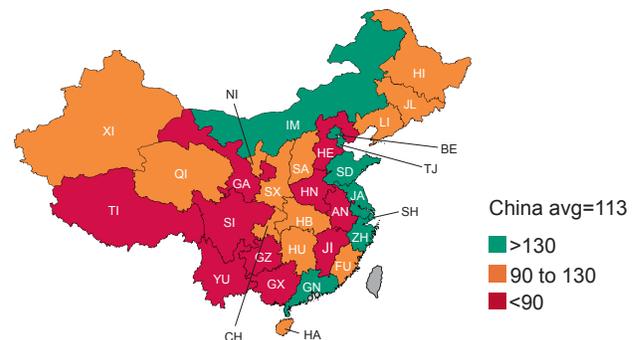
GVA per worker, % change, 2008 to 2018



Sources: NBS, Moody's Analytics

## Chart 18: ...But Gap With East Remains

GVA per worker, 2015CNY ths, 2018



Sources: NBS, Moody's Analytics

productivity gains were higher in China's other regions for the full decade from 2008 to 2018 (see Chart 17). However, despite larger productivity gains in the Center, West and Northeast, there is still a large gap in the level of productivity between the East and China's Center and West (see Chart 18). On average, workers in China's East are 40% more productive than their counterparts inland and about 20% more productive than in the Northeast, where output per worker nearly matched the East as late as 2014.

Given unfavorable demographics across China's regions, the East's comparative advantage in high-tech services will drive faster growth even as growth in provincial economies in the East and in China as a whole downshifts. While manufacturing industries will remain important in the East, growth in high-tech services will drive faster productivity growth and, ultimately, faster economic growth among the region's provincial economies. Even if spillover from the East's tech-driven urban clusters to its provincial economies remains limited, growth in high-tech industries will sustain faster productivity growth relative to China's other regions.

Although workers inland will become more productive as more factories migrate to China's interior and urbanization rates climb, the declining share of value added by manufacturing industries—both in China as a whole and globally—will make it increasingly difficult for China's inland provinces to narrow the gaps with the East in productivity, wages and incomes.

### Policy prerogatives and the provinces

Given the sharp slowdown in growth inland and the still-substantial gaps in productivity and incomes with the East, China's government has pursued policies to achieve a more balanced pattern of growth. The most prominent of these is China's Belt and Road Initiative, which envisions \$1 trillion in infrastructure spending over the next 10 years.<sup>5</sup> While the majority of this sum is destined for infrastructure projects in Southeast Asia, Africa, Central Asia and Europe, the BRI envisions a wholesale expansion of China's internal rail and port network that will link China's more remote western and central provinces to markets overseas. However, while inland provinces will benefit from increased infrastructure investment and improved access to foreign markets, rising competition from manufacturing hubs in Southeast Asia and the small size of many neighboring economies pose challenges.

The BRI is composed of two separate initiatives: The Silk Road Economic Belt—a transcontinental rail route that would link China with Southeast Asia, South Asia, Central Asia, Russia and Europe by land—and a far-reaching initiative to upgrade Chinese and developing country ports, dubbed the 21st Century Maritime Silk Road. Together,

the two mega projects aim to bolster the development of China's inland provinces through better integration with neighboring countries as well as economies in Europe, Asia and Africa. However, with BRI projects in neighboring countries stalling amid concerns over financing and ownership, the build-out of China's internal rail and port infrastructure has taken on new urgency.

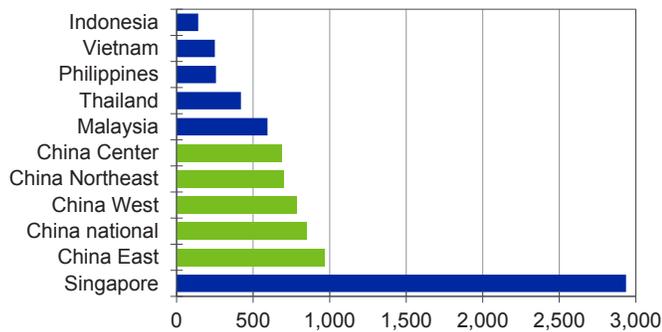
Since Chinese President Xi Jinping announced the BRI in 2013, new rail projects stretching from China's inland provinces to Central Asia and Europe have transformed the economic geography of China's interior, paving the way for a surge in exports from China's Center and West that has raised the importance of manufacturing, transportation and logistics as a share of total provincial output. In the past two years alone, three new freight routes linking China to Europe by rail have opened, cutting shipping times by one-half compared with previous overland and existing sea routes. Though still a small share of total Chinese exports, shipments from China's Center and West have increased fourfold since the opening of the Chongqing–Duisburg freight line in 2010, the first transcontinental freight line originating in China's Southwest.

While new rail lines initially benefited from hefty state subsidies, rising cargo volumes have brought down costs and paved the way for new investment. For example, new transcontinental freight lines originating in the cities of Xi'an and Zhengzhou were inaugurated in the past year and stretch as far as Munich and London, passing through the

<sup>5</sup> Estimates of the size and scope of the Belt and Road Initiative vary by time horizon and source of investment, but most studies place the 10-year total of investment by China at \$1 trillion. The Center for Strategic and International Studies reviews estimates from distinct sources. See "How Big Is China's Belt and Road," CSIS Commentary, April 3, 2018. <https://www.csis.org/analysis/how-big-chinas-belt-and-road>

## Chart 19: Wages Lower in Most of SE Asia

Avg monthly earnings, \$, 2016



Sources: International Labour Organization, NBS, Moody's Analytics

provinces of Henan, Shaanxi, Gansu and Xinjiang, where they load up on oil, natural gas and other commodities for the return trip. New transcontinental rail lines originating in the provinces of Chongqing and Sichuan will cut shipping times from China's southwest and could deliver a further boost to manufacturing and exports.

However, while BRI-inspired rail projects will increase global linkages with China's interior, prospects for a further narrowing of the gaps in output and incomes with the coast are far from a sure shot. While new freight routes will pass through much of China's Center and West, benefits will likely accrue to a handful of provinces such as Sichuan and Chongqing, which leveraged assets from China's earlier periods of state-led industrialization to grow into modern manufacturing hubs. And while new transport links have increased the relative importance of manufacturing activity in the Center and West, the majority of Europe-bound cargo shipped on new rail routes originates in eastern factories, according to shipping data from the Zhengzhou Land Port and Logistics Center.

For central provinces such as Henan and Anhui that have grown in both manufacturing production and exports, east coast ports will likely remain the primary shipping centers. Despite shorter shipping times via rail, ocean transport still offers a considerable cost advantage.

Rising wages inland will be a further hurdle for factories in China's Center and West. While the Center and West offer a cost ad-

vantage over eastern factories, this edge has faded over time: Per-worker wages in the Center and West are now 70% and 80%, respectively, as high as in the East, compared with just 60% in the early 2000s. While wages across China's regions are still low relative to more developed Asian

manufacturing powers such as Japan and Singapore, they are now significantly higher, in nominal dollar terms, than in Southeast Asian manufacturing hubs Malaysia, Thailand and Vietnam as well as in emerging manufacturing centers such as Indonesia and the Philippines (see Chart 19). Despite inland provinces' improved access to infrastructure, shorter shipping times, and reduced freight costs, these advantages may not be sufficient to offset Southeast Asian economies' comparative advantage in the form of cheaper labor. China has already ceded some of its global market share in textiles and apparel to Vietnam, and China's dominant position in higher-value manufacturing industries could weaken as other Southeast Asian economies climb the value-added chain.

Finally, while the BRI aims to jump-start the economies of the Center and West through increased exports to neighboring countries such as Kazakhstan, Myanmar and Pakistan, per capita incomes in the latter two countries rank in the bottom quartile of the world's economies and their citizens' ability to absorb new consumer goods will likely be limited in the near term. Therefore, any near-term boost in external demand for Chinese goods from countries along its western and southwest borders will likely be muted.

Despite the rapid development of rail links and inland logistics parks in central and western China, the greatest near-term benefits from the BRI within China may accrue to Northeast provinces. Demand from new infrastructure projects both within China

and beyond for steel, machinery and refined petroleum products could prove a boon for the industrial Northeast. However, prospects for a long-term revival based on BRI-linked projects by themselves are slim; once construction projects draw to completion both within China and in other countries, Northeast provinces will face reduced demand for building materials and industrial goods.

While the BRI seeks to transform the economic geography of China's provinces through transportation links, a second major policy program—Made in China 2025—aims to elevate the importance of high-tech industries nationwide and in so doing achieve a more even distribution of economic growth. MIC2025 is China's first nationwide industrial policy since the country's opening up to global trade in the late 1970s. MIC2025 seeks to achieve self-sufficiency in high-value manufacturing; elevate the competitiveness of existing high-tech service industries; and establish global standards in telecommunications, transportation equipment and computing.

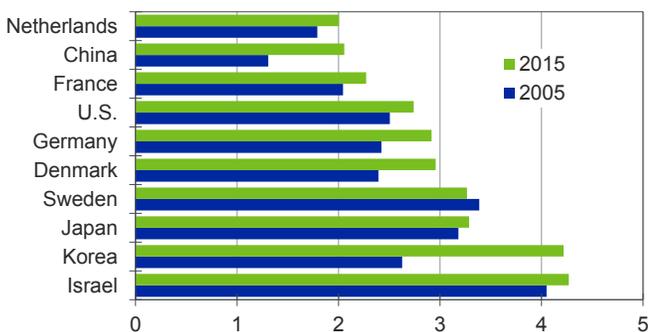
Although narrowing regional inequality in output and incomes is not a primary objective of MIC2025, the push to move into higher-value manufacturing industries and launch new tech-oriented service firms has hardly been confined to the East: Microchip manufacturers in Chengdu have been among the largest recipients of government subsidies, while electric carmakers in Hangzhou and Xi'an are at the center of China's push to develop driverless vehicles.

Although Chinese firms are still reliant on imported components in microchip production and other high-tech manufacturing industries, the country has made large strides in a number of innovation metrics over the past two decades. For example, from 2005 to 2015, China vaulted into the ranks of the top 10 countries with the highest share of nominal GDP spent on research and development. Meanwhile, the registration of new patents per person now trails only that of the U.S., Germany, Korea and Japan (see Charts 20 and 21).

Educational outcomes have also improved. Although the share of the adult population with a bachelor's degree still trails

### Chart 20: R&D Spending Cracks Top 10

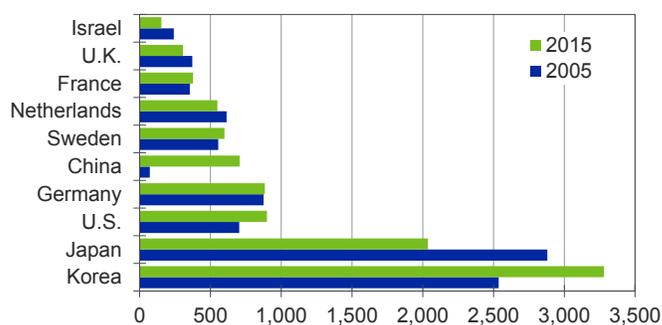
Gross domestic expenditure on R&D, % of GDP



Sources: UNESCO, NBS, Moody's Analytics

### Chart 21: Chinese Firms Eager to Patent

Resident patent applications per mil population



Sources: UNESCO, NBS, Moody's Analytics

the U.S. and more developed countries in Europe and Asia, China's educational attainment is on par with that of other developed countries in the early stages of their respective technology booms, such as the U.S. in the 1950s, Japan in the 1980s, and South Korea in the early 2000s (see Chart 22). However, both educational attainment and research and development spending remain highly concentrated in China's East, with educational attainment considerably higher in eastern provinces (see Chart 23). While the share of the adult population in Beijing and Shanghai with a high school degree has risen relative to urban centers in developed economies, this metric is substantially lower in central and western provinces.

As with educational attainment, patent activity and research and development spending are heavily concentrated in the East, with the provinces of Jiangsu and Guangdong accounting for two-thirds of the

total resident patent applications in China (see Chart 24). Similarly, the number of patents in force that originated in eastern provinces comprises more than two-thirds of the national total.

While several central and western provinces have attracted investment in high-tech manufacturing via MIC2025, the East's lead in educational attainment and innovation will preserve its status as the country's brain trust. Barring faster improvement in educational attainment in central and western provinces, nascent tech hubs in Chengdu and Xi'an will remain the exception rather than the norm.

#### Regional outlook

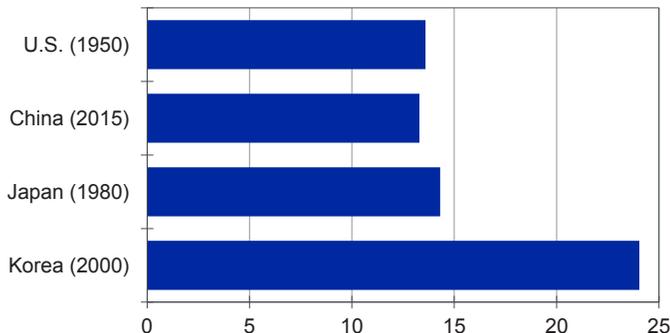
China's provincial economies are cooling as they shift from reliance on export-led growth to domestic consumption. This shift is part of the natural coming-of-age process for developing economies and has coincided

with the growing share of services in total economic activity. However, not all service industries pack the same punch. Provincial economies with thriving high-tech service industries, the majority of which are concentrated in the East, have slowed less and experienced larger gains in productivity than resource-driven economies inland. This shift in China's economic geography will shape the contours of growth at the national level, with the East's pace-setters playing an outsize role in driving productivity and overall economic growth.

Nonetheless, China's provincial economies are endowed with distinct comparative advantages that have been transformed over the past decade by global trade and transportation linkages. This transformation has played out not only in the manufacturing powerhouses of China's East but in the provincial economies of the country's Center and West as well. By and large, this transfor-

### Chart 22: Human Capital at Inflection Point

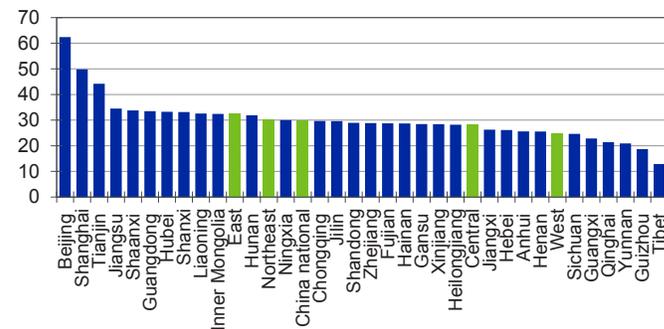
% of the population with a bachelor's degree



Sources: UNESCO, NBS, Moody's Analytics

### Chart 23: East Leads in Education...

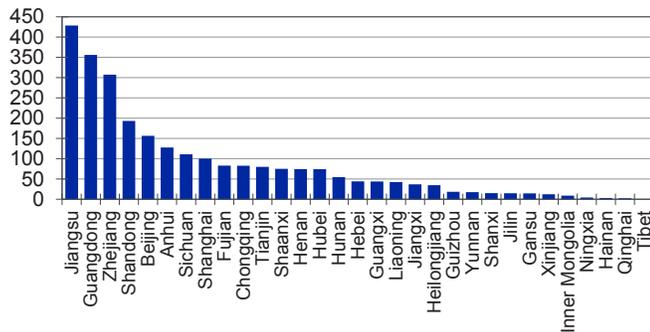
% of population with a high school degree or higher, 2015



Sources: NBS, Moody's Analytics

## Chart 24: ...As Well as Patent Activity

Total domestic patent applications, ths, 2015



Sources: NBS, Moody's Analytics

mation has brought positive change in the form of greater productivity, higher incomes and higher wages. Exposure to global trade has proved less transformative for China's Northeast, which remains wedded to old-line manufacturing industries and has struggled to adapt to a global economy less reliant on physical capital.

The economic drivers that anchor China's provincial economies are as diverse across its four regions as they are within. The province of Sichuan, which sits at the heart of China's agricultural basin but is also home to the tech-charged mega city of Chengdu, is but

prosperous East, this process of convergence has come to a halt. Given the growing value-added share of high-value service industries, which are clustered in the East, China's central and western provinces will be hard-pressed to make further gains. After taking a back seat to China's central and western provinces in output, income and productivity growth over the past decade, China's East is poised to re-emerge as the country's undisputed leader. While policies such as China's BRI will pay dividends for China's Center and West in the form of greater infrastructure investment, structural deficiencies

one example. Less often noted is that China's coastal provinces are also home to large agriculture industries despite the small share of these in total economic activity.

While China's inland provinces have made strides in narrowing the gaps in output, incomes and wages with the more

in educational attainment and rising labor costs will prove harder to overcome and will pose obstacles to attracting high-value service industries such as software publishing and informatics.

Simmering trade tensions represent the greatest risk to the outlook. Should the current standoff between the U.S. and China over tariffs escalate into a broader trade conflagration, the hit to global demand would deal a setback to economic growth across China's provinces. While eastern provinces would suffer most, the spread inland of China's manufacturing industries and trade routes makes provinces in China's Center and West vulnerable as well. Therefore, a significant escalation of trade tensions would put once-isolated rural economies in peril.

While we have noted faster productivity gains in high-tech service industries and, by extension, provinces with a large share thereof, the still-high share of manufacturing industries in their industrial base likely underestimates the scale of these differences. Future work on China's economies at the prefecture level will more closely address productivity gaps between China's rural and urban areas, and between urban clusters that rely more on high-value services than manufacturing.

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