Economics & Strategy

Understanding China

Automation drive is essential and welcome

Group Research

9 April 2018

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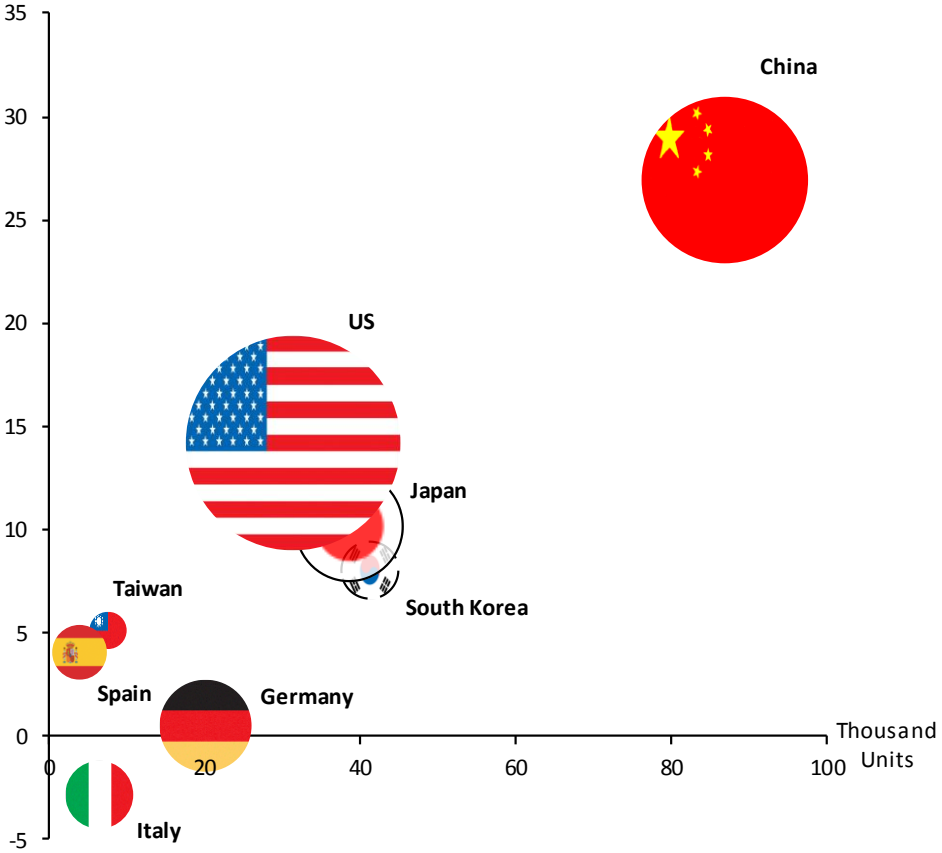
- *Faced with aging, rising cost, and declining economic growth, China needs automation to boost productivity and maintain competitiveness.*
- *So far, the impact of automation on China's overall workforce has been modest amid low robot density.*
- *The complementary effect of automation has also outweighed the substitution effect, i.e. job creation has outstripped job losses.*
- *Occupations that require high degree of social interaction such as nursing and healthcare are less prone to automation.*
- *Wage polarisation could be avoided as China's unprecedented urbanisation creates large-scale employment for middle-wage jobs.*

Impressive growth in robot shipment

Robot shipments in 2016

Size of bubble indicates nominal GDP of the economy



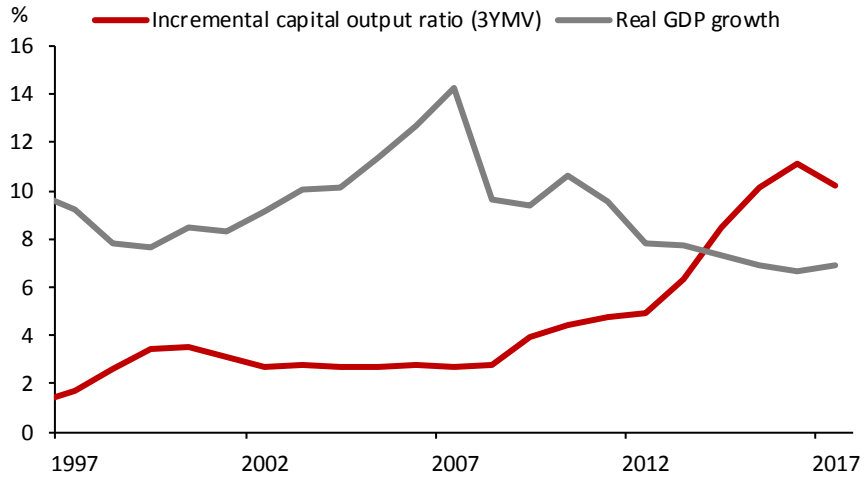
Source: International Federation of Robotics

Dwindling productivity growth

China's economy has witnessed impressive growth since the country opened its doors in the late 1970s. GDP surged from less than USD0.2bn in 1978 to USD13tn in 2017, lifting more than 600mn people out of poverty. This achievement has been built on two powerful pillars: tens of millions of workers migrating from the countryside to power the mainland's industrial economy and the government's massive investments in factories, infrastructure, and machinery.

However, the growth in the number of migrant workers seeking city jobs has slowed since 2005. Also, the massive expansion of capital investment hitherto has resulted in a decline in capital efficiency, evident in the surge in incremental capital output ratio (Chart 1). Productivity has fallen as a result. After achieving an annual average of 8.8% during 2001-10, productivity growth declined to 5.2% in 2011-17.

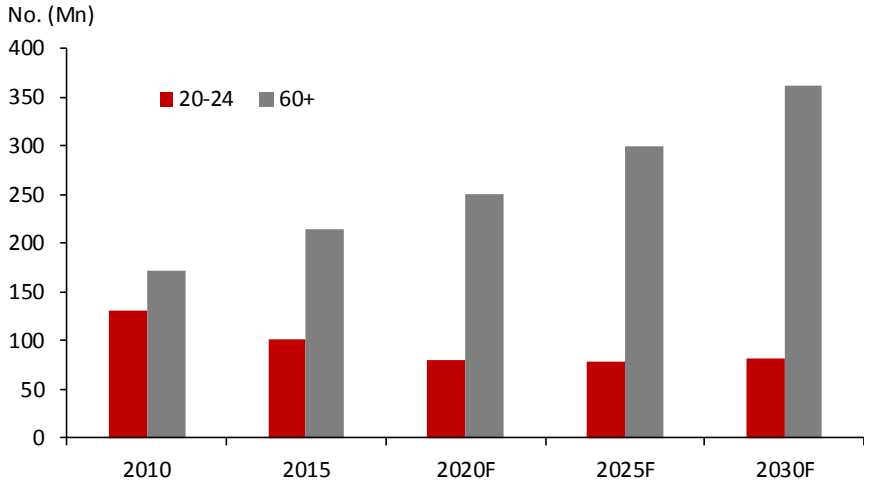
Chart 1: Incremental capital output ratio and GDP growth



Productivity growth is faltering due to aging population and SOE domination

An ageing population and domination by state enterprises are a recipe for weak productivity growth. The projected division between China's young and aged populations by 2030 is stark. According to the United Nations' forecast, the number of Chinese aged 20-24 will decrease 40% to just 81mn (6% of the predicted population) and the number aged over 60 is projected to rise to 362mn (25% of the projected population) (Chart 2). The speed of this demographic shift will become more apparent, given the falling fertility rate, which dropped below the "replacement level" in the 1990s and currently stands at 1.60.

Chart 2: China's population by age group



Source: United Nations

The relaxation of the one-child policy in 2013 is unlikely to have a notable demographic impact, particularly in urban areas where couples are now reluctant to have two children due to high living costs. An aging population pushes up healthcare costs and pension expenditure, which in turn will translate into a larger fiscal burden.

The ROA at SOEs has always lagged that of private firms

The next challenge is the drop in private investment. In 2017, investments by state-owned firms were up 10.1% YoY, compared with a 6% expansion for private firms. A larger share for the state sector of the economy will be a drag on efficiency. Underlying causes are manifold including misallocation of capital. There has been a fresh push over the past few years on state-sector reform, from introducing mixed ownership to corporatisation. Yet, little progress has been made in closing the profitability gap between SOEs and their private counterparts. Since 2008, private enterprises have delivered a ROA of around 10%-14%; for SOEs, it has run between 3%-6% (Chart 3). Despite poor returns, SOEs have dominated investment (Chart 4).

Chart 3: Return on assets

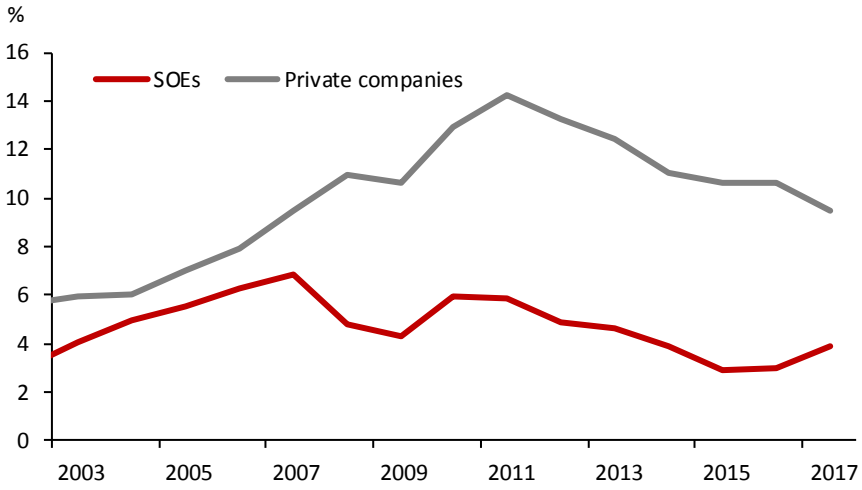
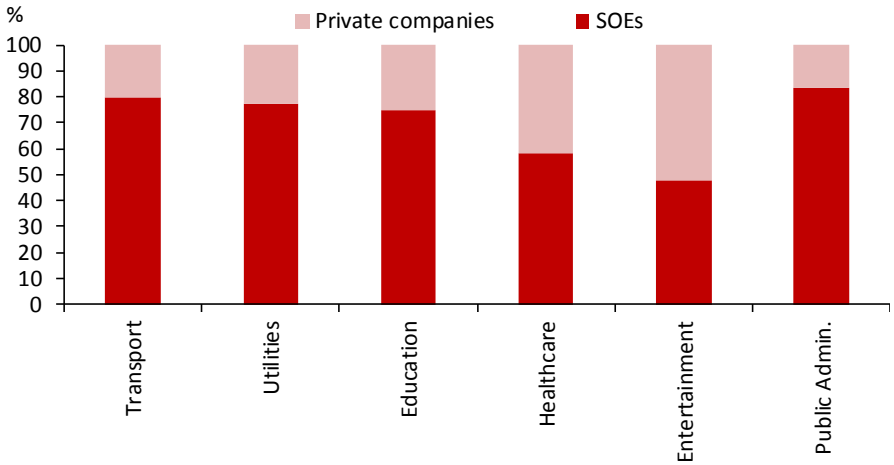


Chart 4: Fixed asset investment in tertiary sector



Automation is the key to reviving productivity

Against this backdrop, automation is key to reviving productivity. Academic literature has long recognised the importance of technology on growth and productivity, and China has been following these trends accordingly. Robots were first mentioned in the Government Work Report of 2014, in the context of China's aim to achieve "major breakthroughs in super computing, intelligent robots, super hybrid rice, and other key technologies". President Xi Jinping called in a speech to the Chinese Academy of Sciences in 2014 for a "robot revolution'', in a nod to automation's vital role in raising productivity.

Thanks to the government's efforts and incentives over the past few years, China is forging ahead with great force in the field of robotics, known as "the jewel in the crown of manufacturing". And this great force comes from the 13th Five-Year Plan (2016-2020), the Made in China 2025 programme, the Robotics Industry Development Plan, and the Three-Year Guidance for Internet Plus Artificial Intelligence Plan (2016-2018).

The current state of the Chinese robot industry

Shipments of robots to China increased 27% in 2016

China installed 87,000 industrial robots in 2016, up 27% YoY and a record for any country (Chart on the front page). The main drivers were the electrical and electronics industry, with sales jumping 75% to almost 30,000 units. Major manufacturers of electronic devices (e.g. semiconductor and chips) have invested heavily in automation.

Meanwhile, the automotive industry has remained a powerful driver of industrial-robot sales. Between 2011-16, a total of 108,000 units were installed, representing an average increase of 18% per year. Sales to China made up 25% of the global supply of industrial robots in the automotive industry in 2016. Large battery-production facilities are being installed to meet the increasing demand for electric and hybrid cars. China is currently the world's largest car market and production site for automobiles. Some international robot suppliers have already set up production plants in China and more will likely follow suit in the coming years. This implies ample growth potential of the use of robots in the car-making industry. In fact, the impact of automation on growth appears to be promising. In 2016, motor vehicle production grew 15%, compared to the industry average of 6.2%.

While automation brings substantial improvements in prosperity, the transition also creates challenges. International experience suggests that technological advancement has in some countries led to subdued growth in wages and loss of jobs. For example, digitisation has been affecting the occupational and skill mix of the US workforce since

the 1980s. Employment in middle-skill jobs has declined, given the many routine production and assembly tasks being automated.

No doubt such concerns have been amplified by recent headlines about robot adoption by some well-known companies. Foxconn, supplier to Apple and Samsung, has replaced 60,000 factory workers with robots. China's home-appliance maker Midea's USD4bn acquisition of German robot giant Kuka also highlights the scale of ambition in automation by the world's factory. Aside from manufacturers, e-commerce giants are also following suit. Alibaba has been putting robots to work - picking up and moving around stacks of goods in its logistics warehouses. Together, fears are rising that robots might take on many of the jobs that once pulled hundreds of millions out of poverty in China.

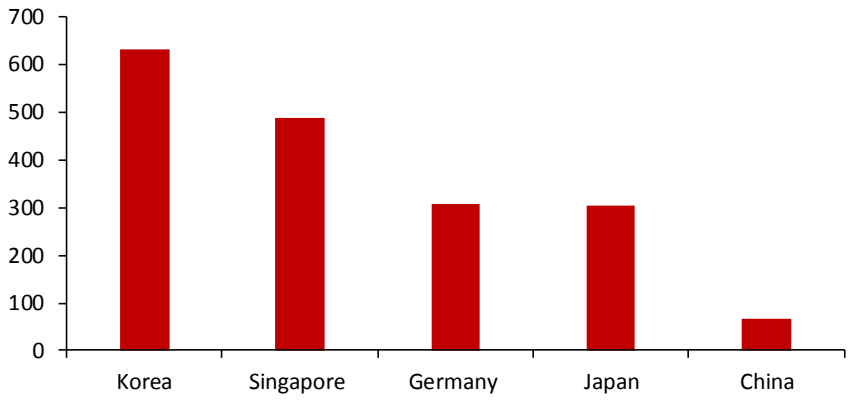
Automation will not happen overnight

Overall robot density is still low

However, such worries ignore the country's relatively low robot density. In 2016, China had only 68 robots to every 10,000 persons employed in the manufacturing industry, versus the global average of 74. The most automated countries are the Republic of Korea (631 units), Singapore (488 units), Germany (309 units), and Japan (303 units) (Chart 5). Even assuming that robot installation would register a 20% annual growth in the next few years, China's robot density will just be around 166 (per 10,000 workers) by 2020. This reinforces the fact that the growth in robot installation so far has not depressed wages in the country. From 2010 to 2016, the wages of manufacturing workers surged more than 90%.

Besides, technical feasibility is not the only condition for automation; cost and elasticity are also pivotal factors. Empirical analysis has shown that technological progress lowers the price of investment goods and thus induces firms to substitute capital for labour[1]. But this is by and large an advanced-economy phenomenon. In China, information and communications technology capital as well as machinery and equipment (the group of capital goods that leads the decline in the relative price of investment) account for a mere 6% in its investment goods basket. That stands in stark contrast to the situation in developed economies. For instance, a similar basket of capital goods accounts for 62% in the US and 56% in South Korea. As such, the impact of technology on labour will be less pronounced in China, reflecting a milder decline in the relative price of investment goods.

Chart 5: Robot density of selected countries in 2016



Source: International Federation of Robotics

[1] World Economic Outlook, IMF, Apr 2017

Augmentation rather than substitution

Automation enables lower-skilled workers to work on higher value-added jobs

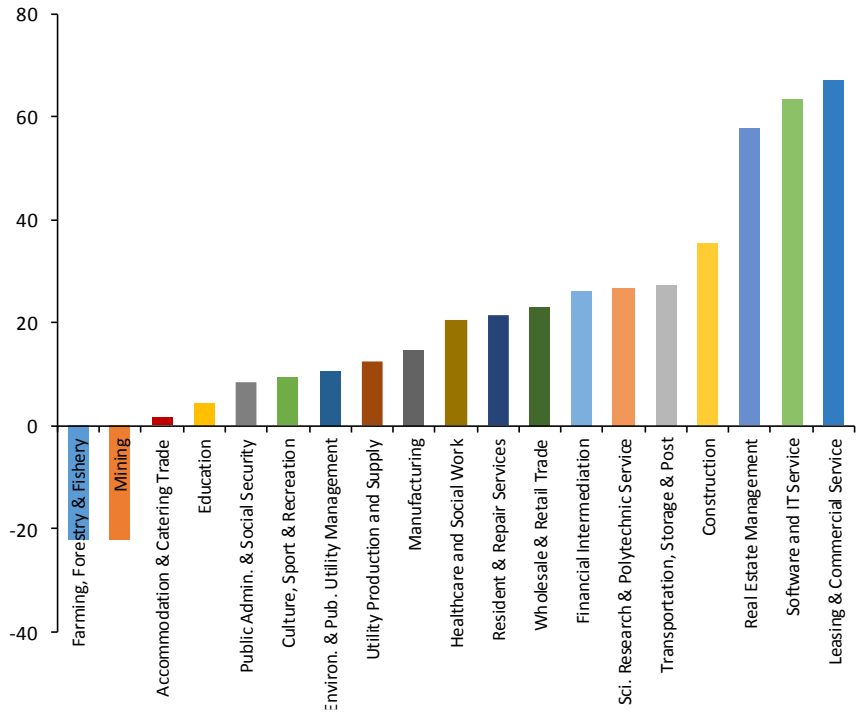
Wider adoption of technology enables those with lower skills to work on higher value-added jobs. Such an complementary effect mitigates or even outweighs the potential displacement of labour. A great example would be the manufacturing sector. Although it was one of the most heavily-automated sectors in recent years, a net balance of 6.32mn manufacturing jobs was created between 2012-16 (Chart 6). That is equivalent to a cumulative growth of 15%, matching the total labour growth during the period.

A benign interpretation is that the adoption of robotics engineering replaced repetitive tasks previously done by workers. But through training, these workers have been able to focus on higher value-added elements in the manufacturing process such as R&D, as well as process and quality control.

Another example would be the wholesale and retail trade sector, which saw 23% cumulative labour growth during the period. While machines have been able to take over virtually all roles performed by sales staff and cashiers (i.e. self-scanning and self-checkout systems), many companies have opted for a mix of automated and human-operated sales and payment systems. This reflects not only the customers' preference but also the social-interaction factor, which can be important for a human salesperson.

The same is true for financial intermediaries. Nowadays, more and more banking functions can be automated. Payments are increasingly made not in branches but online. Automated advisers enable portfolio allocations to be made at a lower cost. Rule-based algorithms can also be created and used to select as well as assess insurance risks. However, human advice is still preferred when transactions become more complex or involve larger sums (e.g. buying property, withdrawing pension, and private banking). Highly trained and skilled financial professionals can offer tailored recommendations to their clients. That explains why the sector still registered cumulative labour growth of 26% during 2012-16.

Chart 6: Cummulative labour growth (2012-16; %)



Impact of automation on workforce varies by sector

Unsurprisingly, mining and agriculture & forestry were the only two sectors that recorded net job losses during the period. Automation is not a new phenomenon within these industries. For many years, cultivation robots, weeding robots, and harvesting robots have been deployed in greenhouses and farms. The drone is the latest in a slew of hi-tech products adopted by Chinese farmers to enhance efficiency. The number of drones deployed for crop-dusting has skyrocketed from only 500 in 2014 to about 8,000 in 2016. Noteworthy, although mining and agriculture lost 20% of jobs, this was relatively insignificant in terms of total employment (4%).

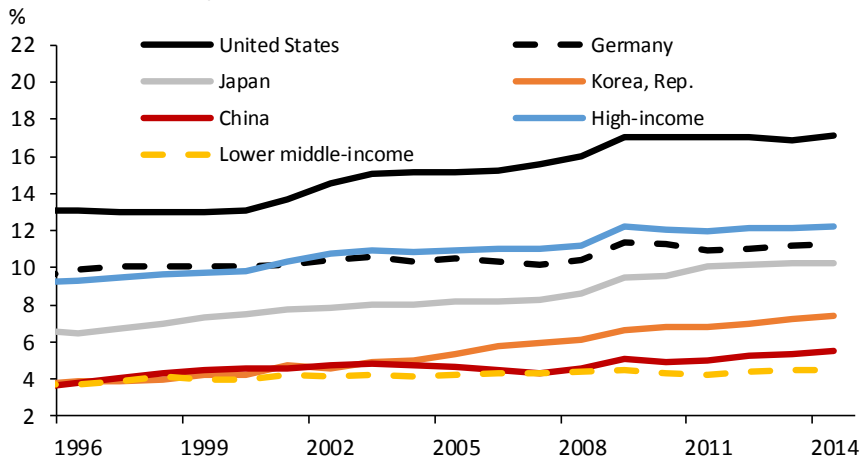
At the other end of the spectrum are jobs in information transmission, software and IT services, leasing & commercial services, and real estate management. The number of jobs in these industries, which require both technical and management expertise, has risen 50-60% during the period.

In sum, automation has had a modest impact on China's overall workforce, although this varies by sector. Generally, the higher the level of skills/education required by the job, the more sheltered it is from automation. Occupations most susceptible to automation include those that involve physical labour in predictable environments, repetitive tasks, and unskilled manual labour. This will likely be the case over the next ten years.

Nevertheless, this correlation should not be interpreted as causal. Whilst training is crucial, it is not the sole consideration in future-proofing employment. Jobs that require a high degree of social interaction, such as nursing and healthcare, are also less vulnerable to automation. Indeed, this industry foresees particularly strong employment growth as the Chinese population continues to age.

A recent study shows that spending on hospital care for an 85-year-old is five times that for those who are 19-44 years old[2]. A positive correlation can also be found between GDP per capita and expenditures in healthcare. In 2014, the ratio of healthcare expenditure to GDP in China was 6%, significantly lower than the US's 17% and Germany's 11% (Chart 7). Demand for healthcare services is expected to grow rapidly as China is set to join the rarefied ranks of high-income economies.

Chart 7: Health expenditure (% of GDP)



[2] US Center for Medicare and Medicaid Services

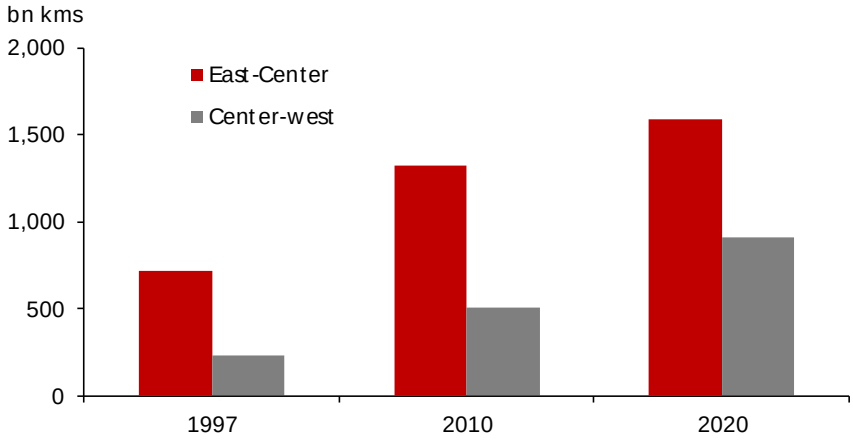
Wage polarisation can be avoided

Aside from the new economy and service industry, another potential source of labour demand will be the construction sector. Notwithstanding the fact that China has already made significant investments in infrastructure over the past decade, there is room to step up construction spending. Home to a growing network of high-speed railways and expressways, the nation still lags in areas such as clean energy and sanitation. China's electricity consumption per capita is about 46% of Organisation for Economic Co-operation and Development (OECD) average. Its water-storage capacity is just a third of the US' on a per-capita basis.

Urbanisation creates large-scale employment in middle-wage jobs

Infrastructure investment has also been unbalanced geographically. Take interregional transport infrastructure as an example. The density of transport infrastructure is much higher in the eastern region, which is endowed with less than 10% of the total land area and 34% of the population. In contrast, the western region occupies 59% of land area and has 27% of the population (Chart 8)[3]. The east–west gap in transport infrastructure will narrow significantly by 2020, according to the government's plan.

Chart 8: Inter-regional Transportation Capacity



Source: Ministry of Railways, National Statistical Bureau

Quality is another concern. The World Economic Forum's Global Competitiveness Report (2017-2018) shows that China ranked 47 in terms of infrastructure quality (Switzerland tops the rankings, followed by Singapore and Hong Kong SAR). Low construction standards recently led to calls for improvement in infrastructure quality with world-scale capacity. A good example is the Hongqiao Hub in Shanghai, an integrated system with high-speed rail service, an airport terminal, and metro connection in one location that also includes a district energy system.

Meanwhile, urbanisation is taking place at an unprecedented scale in China. By the end of 2017, 58.5% of its population lived in urban areas, a dramatic increase from 26% in 1990. If the current trend holds, the urban population will hit the 1bn-mark by 2030, giving China the potential to create large-scale employment for middle-wage jobs such as architects, engineers, carpenters as well as construction workers and machinery operators. In this regard, China will find herself in an advantageous position versus advanced economies, many of which witnessed a decline in middle-income

[3] Infrastructure and Urbanization in the People's Republic of China, ADBI, Jan 2017

occupations in the face of automation. This exacerbated wage polarisation and complicated policy responses.

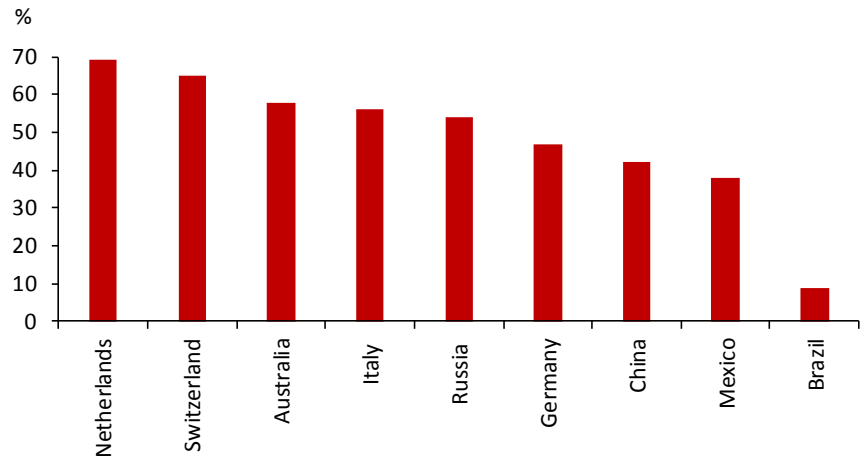
Policy implications - increasing skill development and job mobility is key

Labour transition is essential

Automation is a deep and unstoppable force. Its impact on the workforce will be increasingly visible in the longer term. Many occupations will face structural change or displacement. Hence, facilitating labour transition is essential. Failure to do so could lead to rising unemployment rates, slower wage growth, and even social unrest. Effective policy framework must be put in place to smooth the transition.

Workers most affected by automation are currently the least equipped in terms of education and skills. Thus, increasing opportunities for reskilling through vocational training is important. China's vocational programmes have been badly neglected when compared with the country's rapidly multiplying universities. This owes much to the long-held perception that vocational training is tantamount to dirty hands, a poor working environment, and meagre wages. There are also issues of quality and relevance, as evidenced by limited training equipment and outdated curricula. As a result, participation and graduation rates are low compared to developed countries (Chart 9).

Chart 9: Vocational program enrolment as a share of upper secondary enrolment



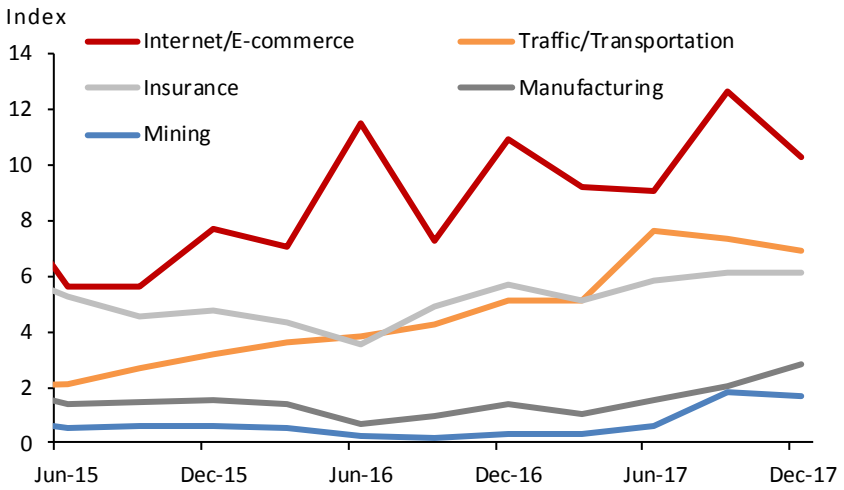
Source: OECD

Improving labour mobility is important

In view of this, an updated curriculum is essential to equip students with the skills necessary for a dynamic, technology-, and increasingly, service-oriented labour market. It is vital for teachers to participate in competency-based training, and the school-industry collaboration to be enhanced such as partnering with enterprises to provide on-the-job training and technical development. The government could encourage and incentivise enterprises, for example, through investment and/or subsidies.

Improving labour mobility is equally important. Currently, there is a significant disjoint in the workforce – companies struggle to find the employee they need, and people cannot find the opportunities for which they are best qualified. According to Zhaopin's China Employment Indexes, there are 10.2 job vacancies for every job seeker in e-commerce, compared to 1.7 in the mining industry (Chart 10). One of the reasons behind the mismatch is that job opportunities abound the most in areas with insufficient skilled labour.

Chart 10: Zhaopin CIER China Employment Index



At present, the hukou system in China designates a resident's status based on his or her registered birthplace. Migrant workers from the countryside are not entitled to public services in the cities. The central government has committed to a goal of giving urban residency to 100mn migrant workers by 2020. But in practice, migrant workers' chances of acquiring an urban hukou differ considerably across the country. New hukou rules in big cities such as Beijing, Shanghai, and Guangzhou remain tough for migrant workers.

Applications are graded according to a points system based on an applicant's education level, tax payments, and work experience. Finances is another concern. Migrants who give up their land rights in hometowns as part of their application for an urban hukou are often not compensated properly. Other deterrents include a lack of affordable housing and difficulty finding stable jobs in the cities. Speeding up the revamp of the hukou system and related reforms could remedy the situation.

A range of other measures including financial aids and psychological counselling can also smooth the transition of workers between jobs. The goal is to avoid long-term negative consequences and provide adequate support for workers caught in the cross-currents of automation. Last but not least, policy intervention is warranted to ensure automation broadens prosperity to prevent a repeat of what happened in developed countries, where income disparity led to a backlash against automation. Reconfiguring tax systems and addressing wealth distribution have the potential to generate a higher degree of equity. Together, the dividends of technological change will be fairly shared; enabling automation to work for the common good.

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Sources: Data for all charts and tables are from CEIC, Bloomberg and DBS Group Research (forecasts and transformations).