

Can China avoid the middle-income trap?

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Introduction

China's economic development is the success story of recent decades, but Chinese growth has lost momentum in the past few years. Such a slowdown is common as a country's wealth increases, and China is now generally considered to be a middle-income country: the average Chinese citizen's purchasing power⁽¹⁾ is now about a quarter of that of the average American. Since 2010, China has been the second largest economy in the world – after the United States – on the basis of nominal GDP, or the third largest if the current European Union is taken as a whole. The country owes its position partly to its huge population.

Against that backdrop, future economic developments in China are vitally important for the state of the global economy. The slightest sign of a possible hard landing for the Chinese economy can spark nervousness on the financial markets and erode global confidence, as the recent past has already demonstrated. If the country would then fail to get its economy back on track, it could fall into the "middle-income trap". Nonetheless, in the positive scenario of a continuing gradual growth slowdown without a crisis, China could become the largest economy in the world by around 2030. That would imply substantial shifts and create new challenges for the current world order.

This article begins by illustrating the "middle-income trap" concept. Next it examines China's principal vulnerabilities which increase the risk of a sharp fall in growth, and then China's strengths that could enable the country to continue its convergence towards high-income countries. However, China's development strategy can expect ever less support from the international environment, as is evident from the recent trade war with the United States and the growing opposition to Chinese investment in the United States and Europe. The article therefore also takes a look at the mounting tensions, before concluding.

1. The "middle-income trap" concept

The recent slackening of the growth rate – down from an average of over 10% between 1980 and 2010 to an average of around 7% in the past few years – has raised the question of whether China is at risk of falling into the middle-income trap. The concept of the middle-income trap originated from the observation that a number of countries have remained

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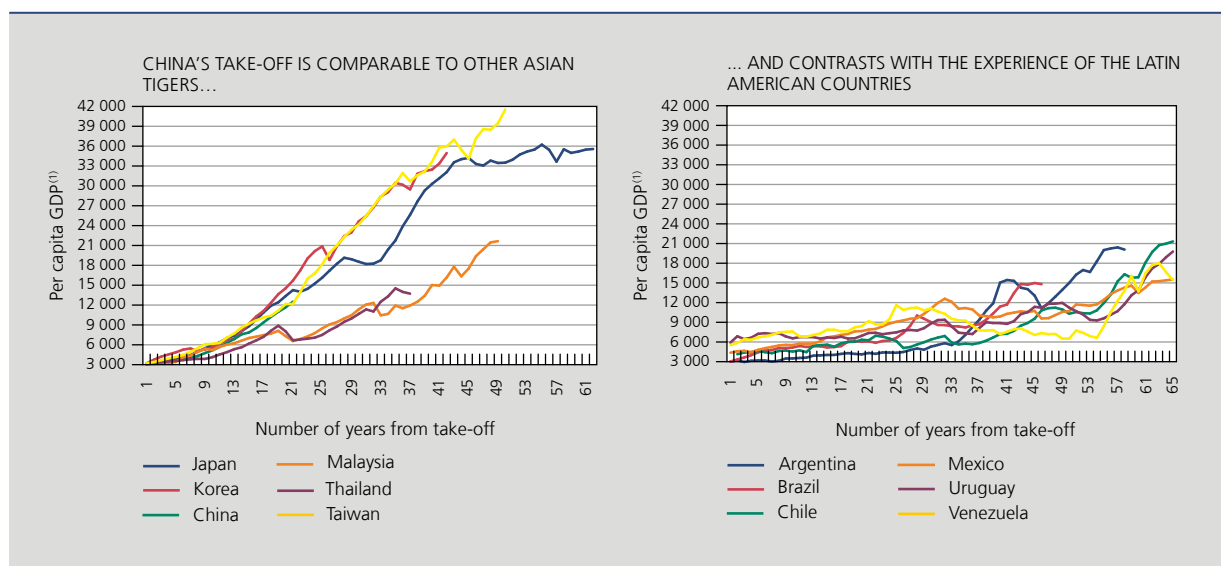
(1) The criterion for calculating purchasing power is per capita GDP in terms of purchasing power parity (2011, US dollars). In this article, per capita GDP is always expressed in terms of purchasing power parity.

for a protracted period (50 years) in the category of middle-income countries based on their per capita GDP, and have not joined the group of advanced countries. This indicates that the transition from a middle-income to a high-income country is much more difficult than the first development phase, from a low-income to a middle-income country.

The reason for this is that, over time, the drivers of the initial growth model disappear, while it is more difficult to establish a new growth strategy. During the economic take-off phase, growth is driven by the employment of abundant, cheap labour as a result of the switch from agriculture to jobs in manufacturing and services, and by the attraction of foreign direct investment, aimed at the development of exports and the transfer of technology. As the labour reserves are being exhausted and basic technologies are acquired, a country has to focus increasingly on sustaining productivity growth within sectors. To achieve that, it is necessary to switch to higher value added products by means of indigenous innovation and industrial upgrading. That also requires the support of structural reforms and investment in education and infrastructure. For many countries, such a process is very gradual, so that they are very slow to converge towards the advanced countries.

By analogy with Aiyar *et al.* (2013), we define the take-off as the year in which a country's per capita GDP first exceeds \$ 3 000. Latin American countries achieved that income level sooner than Asian countries, with the exception of Japan. But the first-generation Asian tigers⁽¹⁾ (South Korea and Taiwan) have since achieved a much higher per capita GDP and are now ranked among the advanced countries. These countries show that the middle-income trap can be avoided. In contrast, the Latin American countries are examples of slow convergence and one can argue they have fallen into the middle-income trap.

CHART 1 CHINA'S TAKE-OFF IS SPECTACULAR, BUT THERE IS STILL A LONG WAY TO GO



Sources: Penn World Tables 9.0, own calculations.
 (1) Real GDP in US dollars, based on purchasing power parities, base = 2011.

The take-offs of Malaysia and Thailand, and more recently that of China, too, closely resemble the take-offs of the most successful Asian countries, but it is too soon to draw any definite conclusions. Empirical studies on the middle-income trap have shown that middle-income countries more frequently experience a marked growth slowdown than the wealthiest countries. Eichengreen *et al.* (2011 and 2013) define a marked slowdown as a decline in the growth of per capita GDP of at least 2 percentage points between two consecutive seven-year periods. A replication of that study based on more recent data confirms that the risk of a sudden slump in growth peaks at a level of per capita GDP

(1) Singapore and Hong Kong are also among the first wave of Asian tigers, but since they are small countries that are not really comparable to China, we have not taken them into account.

between \$ 10 000 and \$ 11 000, and that the risk remains significant up to a level of \$ 20 000 (Dieppe *et al.*, 2018). In 2014, China's per capita GDP was approximately \$ 12 500, a level comparable to that of Japan, Taiwan and Malaysia on the eve of their first growth slowdown. As already mentioned, China's economic expansion has also slackened pace considerably in recent years. However, that gradual slowdown certainly does not constitute a hard landing which would increase the likelihood of the doom scenario of a middle-income trap. Indeed, the Chinese economy is still growing faster than any of the advanced economies and is steadily continuing its income convergence.

2. The main economic vulnerabilities in today's China

However, there is also a downside to the vigorous economic growth of recent decades. Adverse secondary effects include a very large proportion of (ever less profitable) investment in GDP to the detriment of consumption, a high debt ratio due to the rapid expansion of the financial system, a relatively underdeveloped service sector, surplus production capacity in various sectors of manufacturing, growing income inequality, a highly energy-intensive production structure and increasing stress on the natural environment from pollution. Correction of these imbalances, which is essential to maintain the country's financial and political stability, will weigh on future growth. In addition, China faces adverse demographic trends. Below we discuss some of these factors in more detail.

China's growth model is in various ways similar to that of its successful Asian predecessors, e.g. in its strong focus on exports, which have long been supported by an undervalued exchange rate. Moreover, the rapid export growth has benefited from inward foreign direct investment in specially created economic zones, and from massive domestic investment in the expansion of industrial production capacity and in support infrastructure and urbanisation. The government has also played a key role in that process. In comparison with pure market economies, the Chinese government has more options and instruments available to steer the economy. It maintains control over strategic sectors (communication and transport networks, financial sector, (social) media) via public ownership, substantial public support, implicit State guarantees, strict controls, and networks linking the private sector and the Communist Party (the most successful business leaders are Party members), and it continues to own all the land.

In the wake of the global financial crisis, this investment-based growth strategy was further intensified with a massive monetary and fiscal stimulus programme, which mainly took the form of yet more investment in infrastructure and real estate, triggering a housing market bubble. As a result, China's gross investment ratio peaked at 47.3 % of GDP in 2011. Several Asian countries – and Germany, too – recorded similar peaks at an earlier development stage.

In comparison with other countries, China stands out as having an extremely unbalanced expenditure structure, with a gross investment ratio of 46 % of GDP in 2014 and a consumption ratio of only 37 % of GDP. The low share of consumption in China reflects the traditionally high household saving ratio, which remained stable at around 25 % between 1990 and 2015. This in turn can be explained by the lack of an adequate social security safety net, the existence of a demographic dividend⁽¹⁾ up to 2010, and a repressive financial system with low, State-imposed ceilings on deposit interest rates (abolished in 2015), an initially limited offer of savings products, and strict capital controls. The adverse secondary effects already mentioned, which will be discussed in more detail below, indicated that the limits of the current growth strategy had been reached and rebalancing was becoming increasingly necessary. Since 2011, the pace of investment has slowed somewhat, and the government has also adopted measures to support consumption, such as a rise in (minimum) wages and expansion of the social security safety net. Among other things, these measures have enabled consumption to become a more significant driver of growth than capital formation, and the gradual rebalancing process has begun.

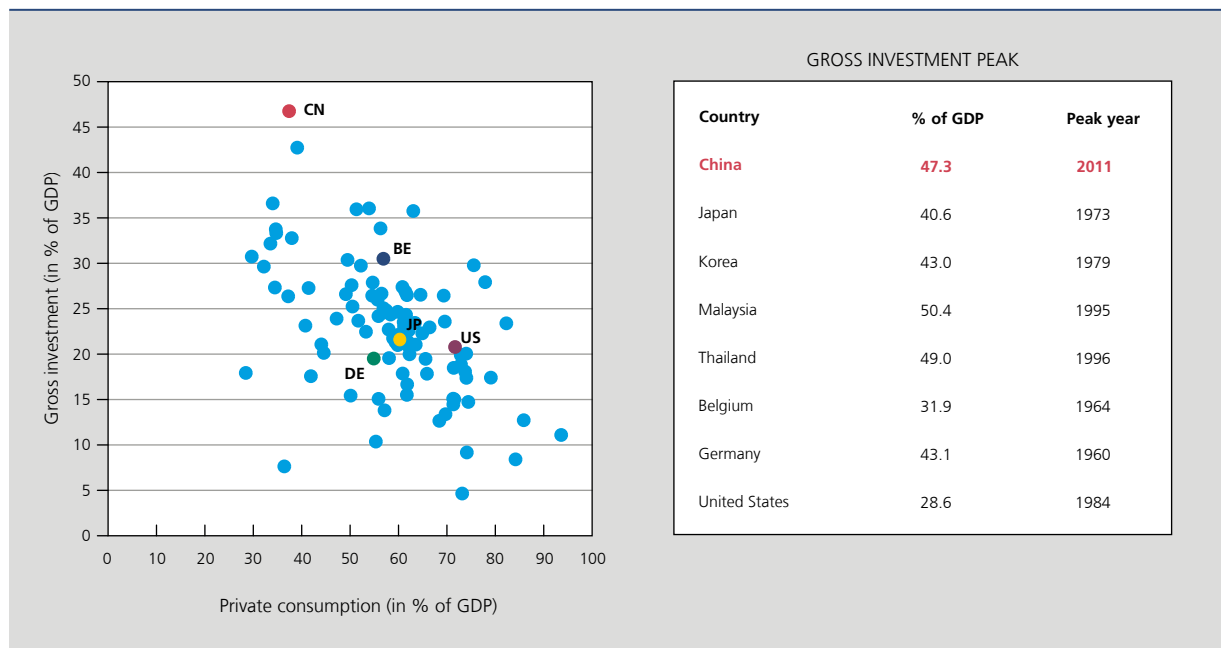
The experience of other countries where rebalancing⁽²⁾ away from investment has taken place shows that the transition to a more moderate pace of investment has generally not been immediately offset by a marked increase in consumption, so that a growth slowdown has proved inevitable (Lodge, 2013). In the specific case of China, recent studies⁽³⁾ indicate

(1) Economic take-off is often accompanied by a decline in fertility and a rise in average life expectancy. Before such time where smaller population cohorts become of working age, there is a demographic window of opportunity in which the percentage of people of working age increases and the dependency rate declines. This is known as the "demographic dividend". In so far as workers save and inactives do not, the demographic dividend leads to a higher savings ratio.

(2) Rebalancing is defined as a situation where there is a fall of at least 4 percentage points in the average share of investment in GDP between two consecutive seven-year periods.

(3) See Chivakul and Kassner (2018) and Ma *et al.* (2016).

CHART 2 LIMITS OF THE CURRENT GROWTH STRATEGY: EXPENDITURE IMBALANCES
(2014)



Source: Penn World Tables 9.0.

that, at first instance, slower investment growth will probably have a negative impact on consumption dynamics via the income effect, given that investment is a major source of employment, particularly in infrastructure and real estate. A second potential negative effect would arise if a slackening pace of investment led to less favourable future prospects. Moreover, the high degree of income inequality⁽¹⁾ may put a brake on more vigorous consumption. It is mainly the poorest provinces that remain heavily dependent on investment as the engine of growth.

Furthermore, in China we also find a close link between expenditure imbalances and production imbalances. Relative to its level of economic development, China is characterised by a relatively large share of manufacturing in output (43 % of GDP in 2014) and a relatively low proportion of services (48 % of GDP in 2014). A comparable output structure can be observed in some other Asian countries (Indonesia, Malaysia and Thailand) which also pursue an export-centred growth strategy. The rebalancing in China is therefore taking place on both sides in parallel. As services are generally more job-intensive than manufacturing, the shift towards consumption and a service society may be accompanied by net job creation, despite the resulting growth slowdown.

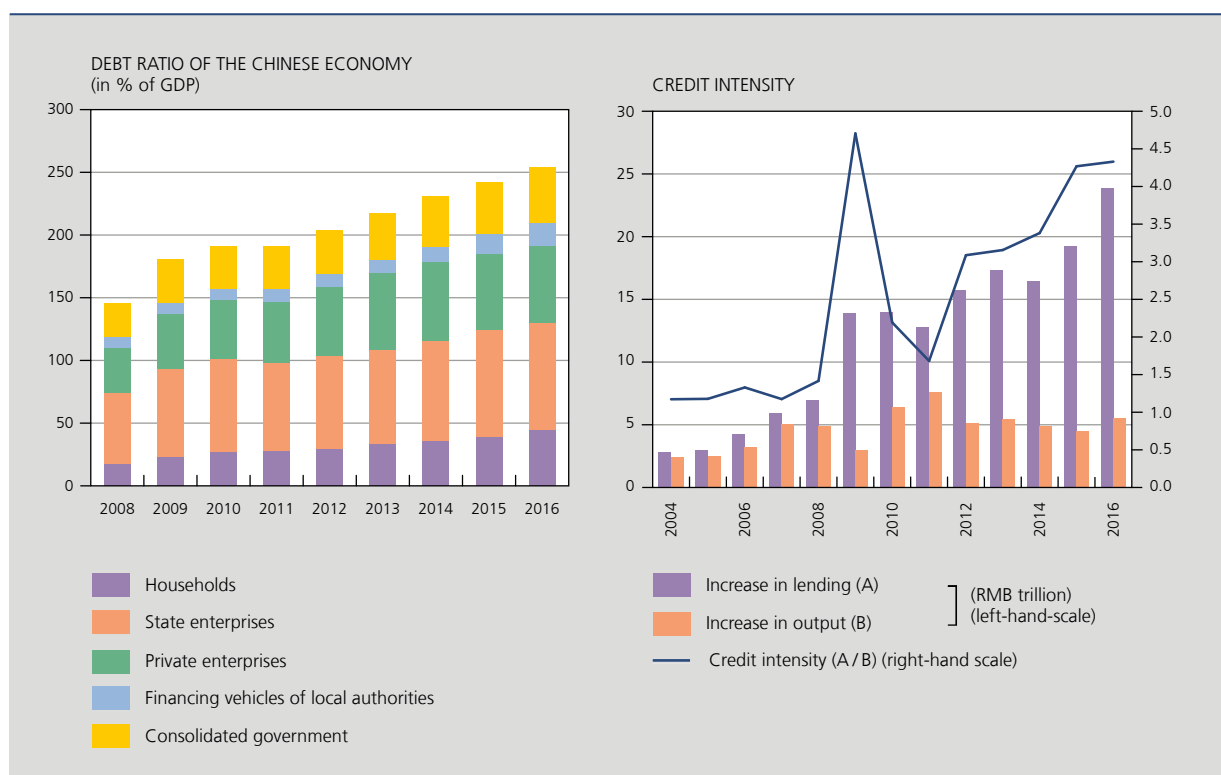
Concerns about China's financial stability have also increased in recent years, as the rapid accumulation of capital has been accompanied by an equally rapid increase in the debt ratio of the non-financial sector, up from 150 % of GDP in 2008 to 250 % of GDP in 2016. This debt expansion is concentrated mainly in the non-financial corporate sector, which also encompasses State-owned enterprises and local authority financing vehicles⁽²⁾. Such rapid credit expansion is cause for concern, as the experience of other countries has shown that it quite often precedes a financial crisis. Even if such a crisis can be averted, a gradual unwinding of the credit cycle often leads to a sharp growth slowdown. Moreover, the debt ratio of the Chinese economy is high for a middle-income country.

Since the global financial crisis the credit intensity of Chinese growth has increased markedly. This declining return on investment indicates that new loans are being granted to fund investment projects which are ever less profitable,

(1) The Gini coefficient for China was 47 % in 2015; the corresponding value ranges between 25 % and 40 % for the advanced countries and other developing Asian countries (South Korea, Malaysia, Thailand), but is almost 50 % for India.
(2) Local authority investment is generally financed off balance sheet by means of special purpose vehicles.

including real estate projects in “smaller” cities. State-owned enterprises are preferential partners in loan contracts because they have implicit State guarantees and are therefore regarded as less risky. They have played a dominant role in the rapid expansion of Chinese infrastructure and have extended their activities to real estate, particularly since the global financial crisis. They also remain strongly represented in heavy manufacturing, which currently faces excess production capacity. For these reasons, State-owned enterprises are less profitable than private enterprises, and the gap between them has widened considerably since the 2007 crisis.

CHART 3 A HIGH DEBT RATIO AND RAPID CREDIT EXPANSION PRESENT A RISK FOR CHINESE GROWTH



Sources: CEIC, IMF, own calculations.

Finally, the rapid development of the Chinese financial sector also gives rise to financial risks (IMF, 2017b). That expansion is taking place both at the level of traditional banks, particularly those of medium size which are generally more vulnerable than the “Big 5” commercial banks⁽¹⁾, and in the “shadow” banking sector. Ehlers *et al.* (2018) define shadow banks on the basis of their main characteristics (specific to China), namely (a) they are literally institutions which grant loans in the shadow of the commercial banks, in order to circumvent the regulations, and which concentrate on riskier sectors such as real estate, local authorities, private enterprises and SMEs; (b) they raise finance by issuing risky investment instruments; (c) in so doing they enjoy implicit or explicit guarantees provided by the commercial banks with which they are associated; (d) the interlinkages between traditional banks and shadow banks are rather obscure; and (e) they make less use of complex financial techniques than their counterparts in the advanced countries. Hence, Chinese financial development has been accompanied by an increasing complexity of the financial system and a rise in the associated risks.

The Chinese government is aware of these risks and is now giving high priority to financial stability. In recent years, numerous measures have been taken to discourage risky practices, increase transparency, and strengthen the supervision

(1) The “Big 5” commercial banks are the Industrial and Commercial Bank of China (ICBC), China Construction Bank (CCB), Bank of China (BOC), Agricultural Bank of China (ABC) and Bank of Communication (BOCOM). The first four are traditional government banks, while in the case of BOCOM, the central government holds a majority stake and HSBC (strategic partner) has a minority stake. These five institutions are listed on the stock market and are among the largest banks in the world.

of shadow banks. Consequently, credit growth has now subsided to its lowest level since 2015. However, the financial excesses are closely connected with the expenditure imbalances in favour of investment, implying that a simultaneous approach is required. Various media report that the central government is adopting measures to discourage debt-financed local authority investment projects. It remains to be seen whether that strategy will be maintained if the real economy experiences a sharper than expected slowdown.

A final very important factor expected to weigh on China's potential growth in the future is the rapid ageing of the population, due partly to the government's one-child policy. In China, the share of the population of working age (15-64 years) in the total population peaked in 2010. At that time, Chinese per capita GDP was barely 20% of that of the United States: never before has a country's population entered the ageing phase at such a low level of convergence⁽¹⁾. According to IMF estimates (IMF, 2017a), in the next three decades this demographic transition will result in an annual average decline in Chinese growth of almost 1 percentage point. The disappearance of the demographic dividend and the speed of China's population ageing mean that, in order to achieve further convergence with the income levels of the advanced countries, China will have to adapt its policy much more quickly by focusing on boosting productivity, in particular by replacing low-skilled older workers with a smaller number of highly skilled younger workers, and on expanding its social security safety net.

3. China's current strengths

Despite the said factors hampering growth, China is fortunate to have a number of strengths which may facilitate its transition to a growth model based on productivity gains. The opening up of the country to international trade and foreign direct investment have contributed to a relatively favourable composition of its export basket, with high-tech products representing an ever-increasing share. The old growth strategy also led to a rapid improvement in the supporting infrastructure. What is more, under the powerful authority of its president Xi Jinping, China has developed a vision for the future which should ensure that, by 2050, it becomes an advanced economy with significant global influence. That vision, known as "Thought on Socialism with Chinese Characteristics for a New Era" was recently incorporated in the Chinese constitution. It comprises an aggressive industrial policy translated into multi-year plans with binding targets at all levels (central government, local authorities and all industrial sectors). As well as pursuing the essential rebalancing, the main targets set in these plans concern the upgrading of Chinese industry, bringing it to the top end of the spectrum, and the pursuit of international integration via trade, foreign investment and the opening up of the neighbouring regions in the context of the new Silk Road (Belt and Road Initiative).

Economic research has already repeatedly demonstrated the importance of countries' export structure for long-term growth. More specifically, the production of sophisticated goods (and services) can trigger a process of learning and innovation, and thus stimulate increased productivity. Here, the degree of product sophistication is defined on the basis of the PRODY index⁽²⁾ of Hausmann *et al.* (2007). That intuitive index is calculated as the weighted average per capita GDP (Y_c) of countries exporting a given product (k), in which a country with a greater revealed comparative advantage⁽³⁾ in exporting product k is accorded a higher weight.

$$PRODY_k = \sum_c \frac{(x_{ck}/X_c)}{\sum_c (x_{ck}/X_c)} Y_c$$

The underlying idea is that rich countries specialise in exporting sophisticated products, while poor countries concentrate on simple, labour-intensive goods. On the basis of United Nations trade data and our own calculations, we find that China's export basket was fairly diversified over the period 2000-2016 and comprised products/sectors with low, moderate and high levels of sophistication (cf. horizontal axis). Moreover, it is mainly in the sectors with a moderate to high degree of sophistication – such as telecommunications equipment, transistors and valves,

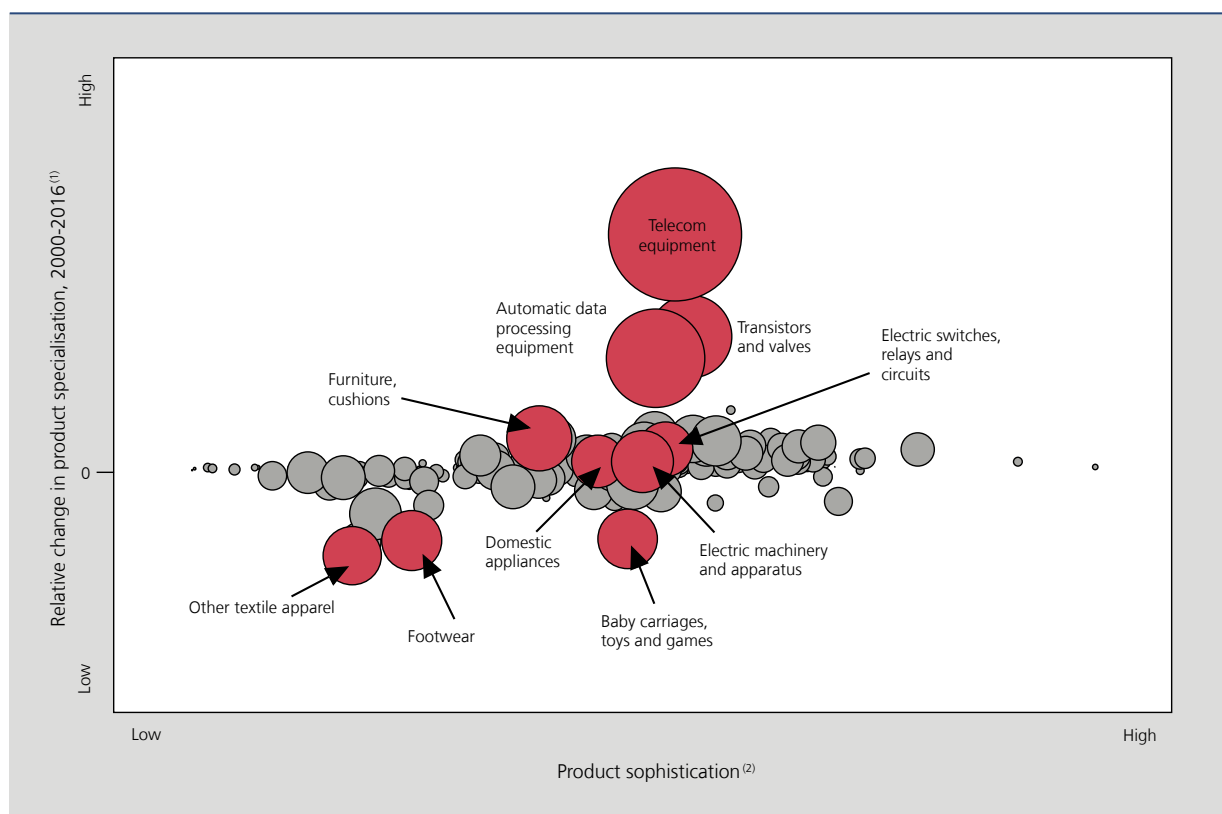
(1) For comparison, in Europe (in France, Germany, Italy and Belgium) and in Japan, the share of the population of working age peaked in about 1990, when per capita GDP stood at just over 80% of that of the United States in its peak year; in Taiwan, this occurred in 2014 at a comparable level of convergence, while in South Korea it occurred in 2013, when the convergence level was 60%.

(2) The advantage of this index is that it does not require detailed data or a subjective opinion on a product's complexity as regards its technological content or the specialist skills involved in the production process. An alternative index developed by Lall (2000) uses a typology (with values ranging from 1 to 5) to define the technological intensity of a product according to the necessary expenditure on research and development and other aspects relating to the production process. That index requires a great deal of data and a high dose of judgement, and becomes outdated as technology advances. Nevertheless, the two methods mentioned here lead to the same conclusion on the relative sophistication of Chinese exports.

(3) The revealed comparative advantage in sector k is calculated here as the ratio between the share of the sector in a given country c's total exports (x_{ck}/X_c) and that same sector's share in global exports $\sum_c (x_{ck}/X_c)$.

computers and other electronic equipment, and electrical machinery – that China had won substantial market shares by 2016, as shown by the size of the corresponding circles. Finally, we observe a shift in the specialisation of Chinese exports, from less sophisticated sectors such as textiles, footwear and toys, towards the more sophisticated sectors mentioned above (cf. vertical axis). This is a first indication that Chinese exports are moving towards the upper end of the product range.

CHART 4 CHINA HAS INCREASINGLY SPECIALISED IN MORE SOPHISTICATED EXPORT PRODUCTS, FROM TEXTILES TO ELECTRONICS



Sources: Own calculations based on UN Comtrade data (SITC rev. 3, 3-digit product classification) and data on per capita GDP (PPP) obtained from the IMF World Economic Outlook (WEO).

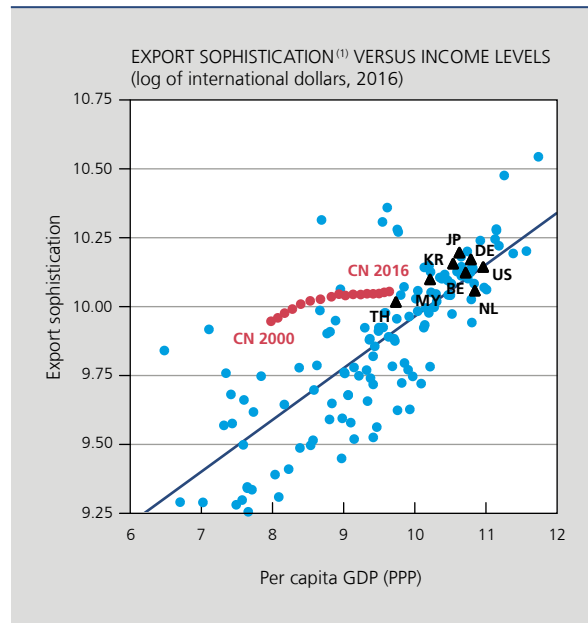
- (1) The y-axis expresses the percentage point difference between the growth of the share of the product category considered in total Chinese exports between 2000 and 2016 and the corresponding growth of the share of the same product category in total world exports.
- (2) Product sophistication, on the x-axis, is calculated as the average value of the PRODY index over the period 2000-2016, in other words, the weighted average of per capita GDP of all countries exporting a particular category of products during the period in question (see Hausmann *et al.* 2007). The size of the circles is proportional to the share of the product category in total Chinese exports in 2016. Only the ten largest product categories in Chinese exports are labelled.

A second index (EXPY), used to measure the degree of sophistication of Chinese exports as a whole, was obtained by calculating the weighted average, at country level, of the PRODY indices corresponding to the exported goods. In this case, the weights are given by the corresponding export shares:

$$EXPY_c = \sum_k \left(\frac{x_{ck}}{X_c} \right) PRODY_k$$

A higher value for the EXPY index implies that a country has a more sophisticated export basket. Given the way the EXPY index is constructed, there is a strong positive correlation with a country's per capita GDP. From 2000 to 2016, China was always above the regression line, which means that its export basket resembles more that of rich countries than its per capita GDP would suggest. More particularly, the degree of sophistication of China's exports in 2016 was comparable to that of the Netherlands, even though the latter is three and a half times as rich, but was still slightly lower than that of some other advanced countries (Belgium, Japan, Germany and the United States).

CHART 5 THE UPGRADING OF CHINESE EXPORTS WAS PARTICULARLY RAPID DURING THE FIRST HALF OF THE PERIOD 2000-2016



Source: Own calculations based on UN Comtrade data (SITC rev. 3, 3-digit product classification) and data on per capita GDP (PPP) obtained from the IMF World Economic Outlook (WEO).

(1) The measure used for the sophistication of total exports is (a logarithm of) EXPY, i.e. the weighted average of per capita GDP corresponding to the countries' export baskets, the sophistication at product level being calculated as the PRODY index for the period 2000-2016 (see Hausmann *et al.* 2007 and the previous chart). The line indicates the best linear fit for the 2016 data.

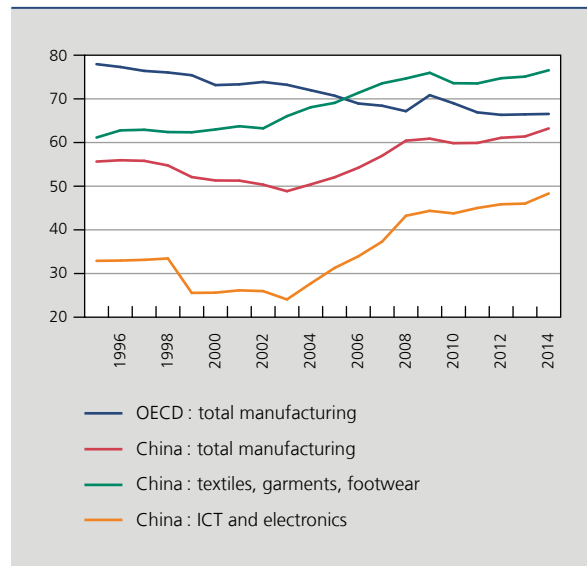
In line with the rising prosperity, the sophistication of Chinese exports has increased considerably since 2000, starting from an already remarkably high level in 2000⁽¹⁾. The progress towards an export structure closer to that of the advanced countries was most pronounced in the first half of the period considered, and seems to have decelerated after 2008. While it might be ever more difficult to continue increasing the sophistication of exports, it should be noted that the index does not take into account variations in quality or the location where value added is created.

However, the fast rise of China as an exporter of sophisticated goods and a formidable competitor for the advanced countries is closely linked to the development of global value chains. During the 1990s, thanks to its vast domestic market, the abundance of cheap labour, its imminent accession to the World Trade Organisation (WTO) and the preferential regimes for foreign investors in the special economic zones, China became an attractive location for assembling imported parts. That happened in the context of a global trend towards ever-increasing international fragmentation of production chains. The manufacturing of ICT, electronic gadgets and cars lent itself particularly well to such a production method. Participation in global value chains enables low- or middle-income countries to penetrate higher technology sectors by specialising in low-skilled jobs such as assembly, and to benefit from economies of scale via trade. That also partly explains why China's export structure (like that of other Asian countries) is relatively sophisticated. Most of the value added is created during the initial stages of production (design and development) and in the final stages (branding and marketing), while the intermediate stages of production and assembly generate less value added. China's initial position as a global assembler was reflected in the country's small domestic share in the value added of its exports up to around 2003. We illustrate that by means of the "Trade in Value Added" (TiVA) database⁽²⁾ of the OECD and the WTO.

(1) Xu (2010) and Rodrik (2006) conclude that China already had a "special" export structure at the beginning of the 2000s.

(2) The calculations are based on figures from the national accounts and input-output tables for the period 1995-2011 and use projections (nowcasting tables) for the years 2012 to 2014.

CHART 6 STARTING FROM A LOW LEVEL, THE SHARE OF DOMESTIC VALUE ADDED IN CHINA'S EXPORTS IS CONVERGING TOWARDS THE OECD (WEIGHTED) AVERAGE
(in %)



Source: Own calculations based on the OECD – WTO TiVA database.

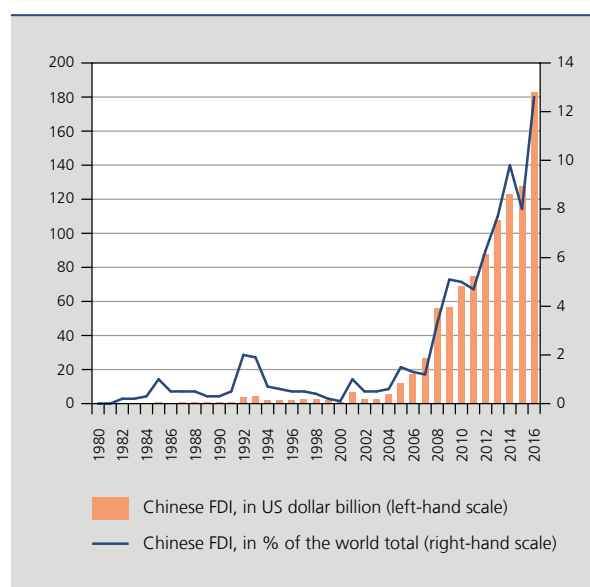
The growing share of value added created in China in the total value added of its manufacturing exports from 2003 onwards is also a measure of the increasing sophistication of Chinese exports. That trend is evident in all sectors where fragmentation plays a major role. This indicates that China is taking on more tasks and replacing imported components with home-produced components (“on-shoring”). In addition, the Chinese government is deliberately adopting a strategy of creating more value added domestically. That substitution takes place at the expense of other countries: among OECD countries, the share of domestic value added in exports is declining. Nonetheless, it is more difficult to ascertain which advanced countries are suffering the most.

The success of the Chinese telecommunications company Huawei, which is now one of China’s “national champions”, is a striking illustration of these ambitions (Ahrens, 2013). Established in 1988 by a Chinese army engineer with the aid of a loan from a State bank loan, it began by selling telephone switches and fire alarm systems imported from Hong Kong. A few years later, the company started manufacturing the switches itself, together with a range of other more advanced products, copying foreign technologies. In 1996, Huawei was rewarded with a number of major contracts for the State and the army. Gradually, the company conquered foreign markets by selling telecommunications equipment and networks, first in emerging market countries and then in Europe and America, too. Today, Huawei does not only compete on cost, but also develops its own products and marketing strategy. In that regard, the company enjoys collaboration on research and development with leading producers such as Motorola, Siemens and Vodafone. Huawei is currently the third largest manufacturer of smartphones (with its own brand) after Samsung and Apple.

Inward foreign investment from advanced countries has long been one of the main ways of acquiring and disseminating technological know-how in China. In a number of strategic sectors, legal restrictions oblige foreign investors to form a joint venture with a Chinese company to facilitate the transfer of technology. Outward direct investment by Chinese companies has also gained ground since the global financial crisis. While there are various reasons pushing these companies to invest abroad, the purchase of foreign technologies and know-how is undoubtedly one of the main motives behind Chinese investments in advanced countries.

Outward foreign direct investment (FDI) by emerging market economies as a group, and by China in particular, is a relatively new phenomenon. Various recent studies have examined the channels through which this outward FDI

CHART 7 STEEP INCREASE IN CHINESE OUTWARD FOREIGN DIRECT INVESTMENT (FDI) SINCE THE CRISIS
(annual flows)



Source: Own calculations based on UNCTAD data.

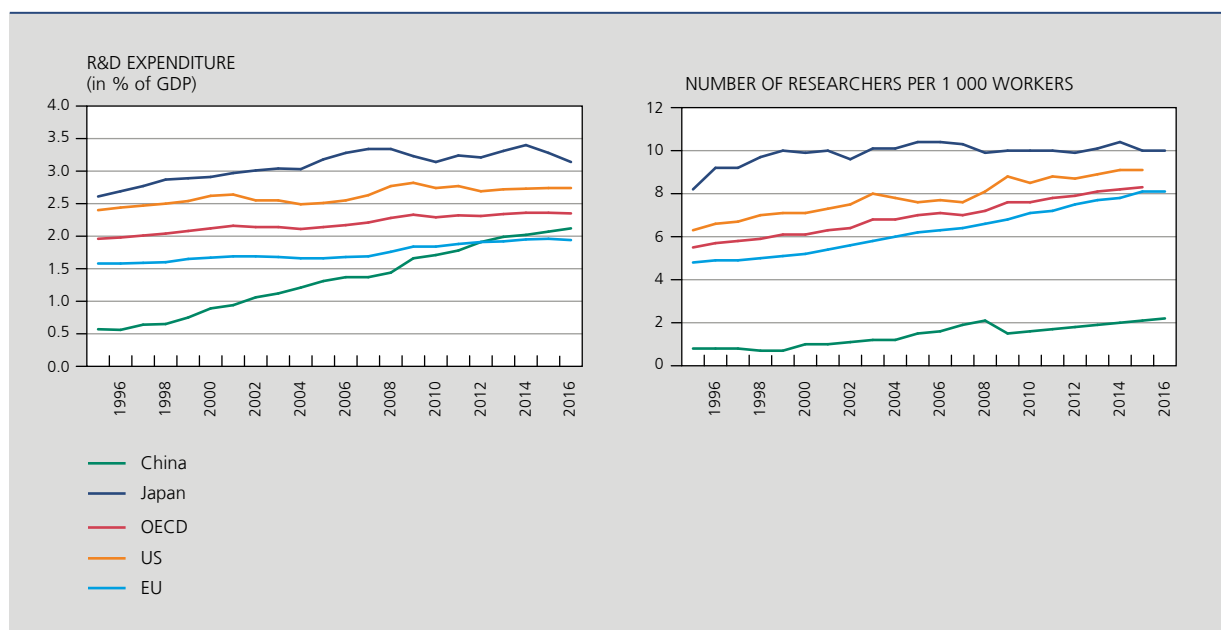
contributes to the development and industrial upgrading of emerging market economies (Chen *et al.*, 2012; Amann *et al.*, 2015; Cozza *et al.*, 2015; Li *et al.*, 2016; Li *et al.*, 2017; Knoerich, 2017). They find that financial returns are not the sole motivation of emerging market countries, as foreign subsidiaries also serve as vehicles for acquiring strategic assets (technology, production processes and organisation methods) and know-how, which are transferred back to the parent company (i.e. reverse technology transfers). These studies also stress that such reverse technology transfers only bear fruit if a number of preconditions are fulfilled in the investor country, including a minimum absorptive capacity, an appropriate legal and institutional framework, supportive policymaking, adequate training, and technological skills.

China seems well-placed to generate positive spillover effects for its own economy via its foreign investments. In recent years, the country has started to catch up in terms of investment in education and research and development (R&D). R&D expenditure expressed as a percentage of GDP is one key gauge of the importance a country attaches to innovation. In China, this ratio increased from 0.7% in the early 1990s to 2.1% in 2016. The country has thus caught up with the EU, though it is still lagging behind technological leaders such as Japan and the United States. Nonetheless, compared to other emerging market countries, Chinese performance in this area is strong.

Another criterion for assessing investment in R&D is the number of researchers among the workers. In that respect, China is still lagging behind, with 2.1 researchers per 1 000 workers in 2015, compared to between 8 and 10 in the main developed countries. That figure should be viewed in light of China's still ongoing process of catching up in education, starting from very low educational attainment levels following the cultural revolution (1966-1976). According to OECD data, the proportion of adults (25-64 years) with higher education qualifications was barely 10% in 2010, whereas this figure was 18% for the younger generation (25-34 years). However, the number of young people completing higher education each year is rising rapidly, and around 40% of them specialise in the STEM disciplines (Science, Technology, Engineering and Mathematics) (Freeman and Huang, 2015). Furthermore, Chinese students in higher education are internationally mobile: representing around 612 000 in the OECD countries as a whole, they form the largest group of international students (20% in 2015). In so far as these students remain in contact with their compatriots and/or return to their home country subsequently, these exchanges contribute to the transfer of scientific knowledge and applications to China.

Moreover, China does not lack supportive policies. In 2015, the government launched an industrial policy entitled "Made in China 2025", which aims to transform the country into an industrial superpower via the use of smart and

CHART 8 CHINA IS CATCHING UP IN TERMS OF R&D EXPENDITURE ... BUT IS LAGGING BEHIND THE DEVELOPED COUNTRIES WITH REGARD TO EMPLOYMENT IN R&D



Source: OECD.

innovative production technologies. The policy focuses on all the high-tech sectors which contribute greatly to growth in the advanced economies (energy-saving vehicles, other means of transport including aviation, renewable energy, mechanical engineering, robotics, ICT, medical instruments, etc.). According to Wübbecke *et al.* (2016), currently China does not have the technological knowledge needed to successfully complete this upgrading; in the short term, that implies opportunities for western businesses. In the medium term, however, the “Made in China 2025” strategy aims for a prominence of technologies developed in China and large market shares for Chinese companies. As usual, the strategy is supported by generous government subsidies for domestic businesses.

However, it is questionable whether the resources for R&D are allocated optimally. In China, R&D is mainly carried out by enterprises but is largely funded by government subsidies. Wei *et al.* (2016) study the link between subsidies and the degree to which enterprises convert their R&D expenditure into innovations in the form of patents and find no positive correlation. Chinese State-owned enterprises receive disproportionately more subsidies than domestic private enterprises or enterprises with foreign capital participation, and on average they file fewer patents. The problem is most significant for subsidies granted by local authorities to the smaller enterprises under their control.

As the richest countries are at the technological frontier and also have a democratic form of government, the prevailing view is that an undemocratic system is not compatible with technological leadership. The argument goes that innovative ideas and new technologies develop and spread most readily in economic and political systems characterised by free competition, protection of (intellectual) property rights, respect for the rule of law under the supervision of an independent judiciary, and free media. As a result of the decentralised government, the emphasis on local experiments and the particular system for promoting Party members, China does exhibit a high degree of competition (Xu, 2011). Conversely, on the other criteria just mentioned, China does not perform as well as the advanced countries. To achieve a breakthrough, the inventor of an innovative concept or new technology needs the support and protection of the local and/or central government. The practice whereby the government chooses the winners instead of leaving it to the free market could possibly hamper technological leadership.

China’s specific institutions have nonetheless undergone a radical transformation in recent decades: since 1978, successive reforms have allowed a greater role for the market economy and private ownership. China has thus

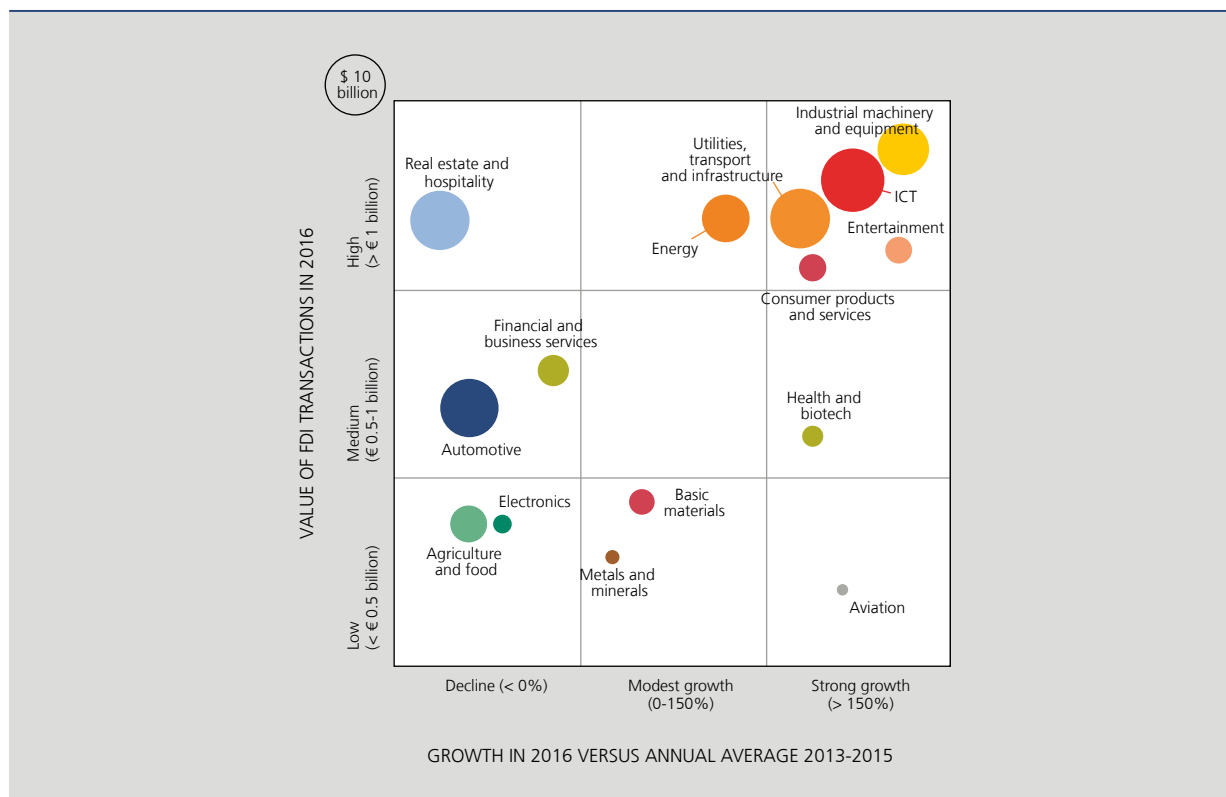
progressed from a State economy to a mixed economy. The growing presence of the free market is generally regarded as a major contributory factor in China's success (Wei *et al.*, 2016). At the Communist Party's Third Plenum held in November 2013, the new Chinese government announced that it would continue to strengthen the role of the markets in the allocation of resources, including a more market-driven pricing, and that it would ensure fairer competition for all participants. However, since president Xi Jinping took office in 2013, one can observe growing scepticism about the role of the free market among China's leaders, and a return to increased government interventionism.

4. Shift to a more hostile international environment

While smaller, fast-growing Asian economies have for a very long time maintained their export-centred growth strategy, that is not an option for China because of its sheer economic size. China's growing market share in total exports has already triggered protectionist responses by the United States and numerous anti-dumping litigations at the World Trade Organisation. More generally, there is a prevailing feeling that Chinese and western businesses are not competing on an equal footing owing to the distortion of prices in China, the generous State support (low energy prices, cheap loans) and the preferential treatment of Chinese enterprises with regard to the awarding of R&D subsidies and public contracts. Although the Chinese government asserts that it respects the rules of free trade, that is not the dominant view among western enterprises⁽¹⁾.

Chinese takeovers of companies in the United States or the EU are likewise encountering ever fiercer resistance. As already stated, China's outward FDI soared after the global financial crisis, but the situation is one-sided. Chinese firms have acquired holdings in the financial sector (Nagelmackers, Deutsche Bank), the car industry (Volvo, Daimler),

CHART 9 CHINESE FDI IN THE EU IS INCREASINGLY FOCUSED ON SPECIFIC SECTORS



Source : Rhodium Group and MERICS (2017).

(1) For more details, we refer the reader to the reports by the European Chamber of Commerce in China.

ports (Piraeus) and port container terminals (including in Antwerp), the nuclear sector (Hinkley Point) and sustainable energy projects. Yet there is no reciprocity on China's part: in the ranking of 62 countries where the OECD has examined openness to foreign investors, China is in 59th place. In response to threats by the United States, president Xi Jinping recently promised to partially open up a number of sectors (finance, aeronautics, navigation) to foreign investors and to grant free access to the car industry (which would eliminate the current obligation to form a joint venture with a Chinese company).

China's direct investment in the EU mainly targets the major western European countries, the southern countries affected by the crisis, Finland, and – more recently – the eastern European countries that are part of the "16+1" group⁽¹⁾ in the framework of the new Silk Road. According to the available data – which are, however, incomplete – the stock of Chinese investment in the EU countries generally still seems to remain relatively small: in 2016 it represented less than 1 % of the GDP of the recipient country in all Member States except for Hungary, Portugal and Finland. Concerns about Chinese FDI in the EU result from an increased focus on strategic and high-tech sectors such as industrial machinery, ICT, energy, transport and infrastructure, etc., i.e. the high priority sectors in the Chinese government's "Made in China 2025" policy.

For some time now, the United States and Japan have been systematically "screening" major Chinese FDI for national security reasons and in order to better protect their economic and scientific potential. As a result, the United States now automatically blocks any takeover bid for local semi-conductor producers, by Huawei or by any other Chinese telecommunications company. By analogy with that practice, in September 2017 the European Commission formulated a proposal for defining a common framework for the examination of FDI originating from third countries, with China in mind. At present, over half of the EU Member States, including Belgium, do not conduct any systematic screening. However, the EC's proposal divides Europe: most of the largest EU countries are in favour of tighter control over FDI, while the peripheral countries, which need investment in their infrastructure, oppose the proposal. These tensions are also thwarting the ambitions of the EU and China to conclude a bilateral investment treaty.

Conclusion

In view of the many uncertainties, it is hard to say for sure whether China will avoid the middle-income trap. On the basis of our analysis, we can be cautiously optimistic on that score.

Apart from the normal growth slowdown that accompanies economic development, the correction of the imbalances – including the financial excesses – will weigh on future growth. Measures are necessary to avoid a financial crisis and curb the accumulation of additional debt, without jeopardising the growth potential. The challenge is to strike the right balance in which rebalancing and industrial upgrading go hand in hand. Demographic trends are also working to China's disadvantage: never before has a country had to contend with population ageing at such an early stage of economic development.

Nonetheless, in various other respects China has a sound basis for achieving future growth driven by productivity gains, such as its specialisation in relatively sophisticated export products, a modern infrastructure and substantial investment in human capital and in R&D. The technological upgrading of the country's economy also opens up new opportunities. The strategy adopted aims at the continued growth of Chinese high-tech exports, on-shoring, the acquisition of technologies abroad via outward FDI, and the establishment of a domestic innovation policy. However, each of these strategies has its limitations: protectionist responses to a further growth of Chinese exports, legal restrictions (in the United States and a number of European countries) on the purchase of technology in strategic sectors by Chinese enterprises with State aid, and potential institutional obstacles concerning innovation.

(1) The 16 countries are Hungary, Bulgaria, Romania, Poland, Bosnia-Herzegovina, Serbia, Croatia, Slovenia, Slovakia, Albania, the former Yugoslav Republic of Macedonia, Montenegro, the Czech Republic, Lithuania, Latvia and Estonia. The suffix "+1" refers to China.

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