The Power of Three
How a new approach to labor, capital and productivity can transform China's economy and businesses
Contents

Foreword 4
Executive Summary 6
Introduction: China Faces Challenges to Its Future Economic Growth 8
China’s growth story 9
Sources of China’s growth in the past 10
China’s productivity growth journey 14

One: China’s Labor Crunch 18
China’s labor dividend has been depleted 20
An overwhelming mismatch in labor markets 22

Two: China’s Real Capital Crisis 24
Fixed investment, important but gone too far? 26
Counterpoint: Investment volume is not a problem in itself 28
What is China’s real capital crisis? The distribution of capital 30

Three: The Path to Productivity Growth 34
Lens 1: At the macro-level, China’s productivity performance has plenty of room to improve 37
Lens 2: At the sectoral level, productivity growth shows huge disparities across sectors 38
Lens 3: Productivity disparities continue at the firm level 41
<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>The Power of Three: From Quantity to Quality</td>
<td>48</td>
</tr>
<tr>
<td>Moving from labor to talent</td>
<td>49</td>
</tr>
<tr>
<td>Making capital count</td>
<td>50</td>
</tr>
<tr>
<td>Promoting efficiency and innovation for long-term growth</td>
<td>51</td>
</tr>
<tr>
<td>Chinese Firms: From Production-Led to Market-Driven</td>
<td>52</td>
</tr>
<tr>
<td>Deepening corporatization and corporate governance reform</td>
<td>54</td>
</tr>
<tr>
<td>Enhancing operational efficiency with technology</td>
<td>54</td>
</tr>
<tr>
<td>Internationalizing from a stronger position</td>
<td>54</td>
</tr>
<tr>
<td>Investing in innovation</td>
<td>55</td>
</tr>
<tr>
<td>Looking Ahead: Deepening Connectivity for the Next Wave of Productivity Growth</td>
<td>56</td>
</tr>
<tr>
<td>Annex</td>
<td>58</td>
</tr>
<tr>
<td>References</td>
<td>62</td>
</tr>
<tr>
<td>Methodology</td>
<td>64</td>
</tr>
<tr>
<td>Acknowledgments</td>
<td>65</td>
</tr>
</tbody>
</table>
China’s economy has entered a critical period of economic transformation. Over the last 30 years, China has achieved remarkable economic growth, but its growth to date has been mainly based on massive levels of labor input and capital accumulation. This growth model does not appear to be sustainable, and China is now seeking economic transformation. The key question is: What should the direction of China’s economic transformation be? This is also the question I have often heard from my clients.

Our research illustrates the sources of China’s growth in the past and in the future. It shows that in order to maintain sufficient economic growth and make a successful transition to a more balanced growth model, China needs to significantly enhance its productivity—that is, the efficiency with which existing resources are used to generate greater output. China’s productivity has been growing impressively over the past decade. But it is still far behind that of developed countries.

Can China’s productivity be improved? The answer lies with the corporates in China. Over the past couple of decades, China’s growth has benefited greatly from institutional and economic reforms. We believe that, in the next decade, highly productive firms must become the major force driving China’s economic growth.

This will not be easy. Our research shows that there are huge differences across sectors and firms with respect to their productivity performance. But the call is clear. In fact, many executives keenly feel the productivity imperative already, and they are curious to learn from Accenture about how to improve in this area.

This research helps to identify the most important ways that Chinese companies can increase their productivity. With data covering a wide range of industries, we have established a rich set of insights with which to help Chinese businesses drive productivity growth and push for high performance.

China’s firms need to shift their strategies from production-driven to more market-oriented ones. The good news is that we have observed that China’s top business leaders are already making tremendous strides in this journey. They are continuously investing in advanced technologies to enhance operational efficiency; they are learning the best practices from global high-performance companies; they are moving into and building their brands around higher value-added activities, and putting more emphasis on innovation. All these efforts are paying off.

We believe that, with deepening economic reform, China’s companies have the potential to achieve even higher productivity and thus more vitality. Looking ahead, in an era of network-driven productivity growth, businesses in China will have great opportunities to leapfrog and grow into world-class high-performance businesses.

By seizing the productivity challenge now, Chinese firms can secure their future in the global marketplace as well as lay solid foundations for growth in the decades ahead.
Productivity is not simply a mechanical relationship between inputs and outputs. Instead, it captures the almost limitless possibilities for combining resources in novel and creative ways for faster economic growth, greater consumption, and higher incomes and living standards. It is the magic ingredient for prosperity; no major economy in history has achieved rapid development without a rapid acceleration in productivity.

China is no exception, but its economy is now experiencing rapid structural change that could undermine productivity and imperil future growth. With an aging population and a workforce that is set to plateau within the next decade, China’s labor bonanza is fast coming to an end. Fixed investment—a traditional mainstay of the Chinese economy—is also set to become less prominent as the Chinese economy rebalances towards consumption. However, China’s challenges can be overcome. Drawing on extensive original research into China’s productivity performance at the macroeconomic, industry, and firm level, this report details the three steps necessary for China to rapidly accelerate productivity levels across the economy while also driving improvements in business performance and profitability.

First, at the macroeconomic level, China needs to move beyond simple capital and labor accumulation, placing a greater emphasis on the quality and distribution of these factors of production. This implies a greater focus on matching the education system to business needs, increasing labor-force participation rates among underutilized groups such as women and the elderly, and developing so-called STEM skills in tandem with softer skills such as team-working, creativity, and innovation. Strategic distribution of the factors of production also means getting more capital to fast-growing sectors of the economy, particularly small and medium-sized enterprises.

Second, Chinese firms can drive faster productivity growth through a greater focus on market-oriented strategies. In practice, market orientation means equipping Chinese firms with the tools to internationalize faster and raise their independent innovation capabilities. Many Chinese firms have already achieved remarkable supply-side growth through efficient production techniques and supply-chain management. However, many firms are only belatedly recognizing the importance of the demand side as well: finding new channels to customers (both at home and abroad) and competing in higher-value industry segments.

Finally, China can lay the foundations for the next era of network-driven productivity growth. In advanced economies, productivity growth comes not just from what happens within firms, but from the interactions between firms—think Silicon Valley and the productivity-enhancing spillovers of knowledge and expertise engendered by dense physical and virtual networks. Our research shows that within China productivity tends to be higher in regions where firms cluster closely together in innovation hubs. While such networks in other parts of the world have taken years to take root, China may be ideally positioned to accelerate the process through the use of digital technologies and smart infrastructure. In particular, the advent of the Industrial Internet—the weaving together of machines, people, and data through sensors and digital networks—can give China a head start in this process.

Franz Kafka once said: “Productivity is about being able to do things that you were never able to do before.” By addressing the productivity imperative now, China too can start doing things it has never done before.
Executive Summary

The productivity imperative

China has witnessed tremendous economic growth over the last 30 years. Its real gross domestic product (GDP, converted at 2005 price) has grown from less than RMB1,775 billion in 1978 to RMB37,026 billion in 2012. In the process, China has become the world’s 2nd largest economy. More than 600 million people have been taken out of poverty.

The business landscape has similarly been transformed. Today mainland China has 85 companies in the Fortune Global 500 list of the world’s largest corporations. Foreign investors have flocked to China’s shores. Many of the world’s iconic brands dot the shopping districts of the major cities.

China’s growth to date has been built largely on the twin bedrocks of a growing labor supply and rapid capital accumulation. However, China now faces two major bottlenecks. First, China’s population is getting older, and the size of the labor force is set to plateau at some time around 2016. Second, the pace of investment growth is also expected to slow as China’s government works to reduce the economy’s reliance on capital-led growth and increase consumption.

These both will make it harder for China to sustain its previous rapid rates of growth over the next decade. Our scenario analysis shows that the only way for China to successfully transition to a more balanced economic model, is to improve its productivity.

The productivity imperative applies to Chinese firms as well. Our research shows that many sectors in China are facing pressures on profitability, and the situation seems to be related to poor productivity: firms with higher productivity growth were found to deliver greater net profit margins. Therefore, productivity improvement is critical for better business performance.

Three lenses on China’s productivity performance

In this report, we examine China’s productivity performance through three lenses: macro, sectoral, and firm.

Macro-level

China’s productivity growth surpasses that of many other countries in the world. However, that impressive trajectory began from a very low baseline level of productivity. At the absolute level, China’s performance is still far behind that of many mature economies.

Sectoral level

The 19 sectors that we looked at exhibited great differences in productivity growth. In general, tertiary sectors such as banking, recreational services, and media, displayed strong productivity growth over the past five years. But some secondary sectors, particularly those which used to be the economic backbone of China’s economy, performed very poorly. And it shows—these disparities are significantly correlated with variations in financial performance across different industries in China.

Firm level

We analyzed variations in productivity performance across a dataset of 3.07 million Chinese firms. Once again, even within industries, firms differ greatly in how productive they are. Four factors were important in differentiating the high-productivity firms from the low-productivity ones. Firms with larger scale, bigger investments in research and development, better use of technology, and higher levels of internationalization are significantly more likely to exhibit strong productivity performance.

Closing the gap

How should China’s leaders—both in government and in business—work to close China’s productivity gap and propel future economic growth and business performance? We identified three broad areas of action.

From factor accumulation to improved quality and distribution

In order to rebalance its economy and close the productivity gap with advanced economies, China needs to shift its focus from simply accumulating labor and capital to improving their quality and distribution. More specifically, China should work on the following:

Moving from labor to talent, including:
- Improving labor-force participation rates among certain segments of the working-age population
- Addressing skills mismatches, especially between formal theoretical qualifications and business-ready skills
- Investing in high-end skills, especially science, technology, engineering, and mathematics (STEM).

Making capital count, including:
- Directing more funds to high-growth small and medium-sized enterprises (SMEs)
- Providing infrastructure to develop smaller cities and towns
- Leveraging information and communication technologies (ICT)
- Applying big data analytics to enhance capital investment decisions.

Promoting efficiency and innovation for long-term growth, including:
- Deepening reforms to increase factor market efficiency
- Promoting competition between foreign, private and state-owned firms
- Strengthening independent innovation capabilities.
From production-driven to market-oriented strategies

Second, Chinese firms need to shift their focus from supply to demand, from production-driven to market-oriented strategies. By doing so, they will be able to move up the value chain, compete with foreign firms in the domestic market and even win consumers as they move into international markets. This will entail:

- Deepening corporatization and corporate governance reform
- Enhancing operational efficiency with technology
- Internationalizing from a stronger position
- Investing in innovation.

Laying foundations for network-driven productivity growth

Lastly, Chinese businesses need to forge strong connections— with adjacent industries, with educational institutions, with customers, with IT vendors. The future network-driven era of productivity growth is fast approaching. The next wave of growth for China’s economy will be driven not only by individual firms’ actions, but increasingly by the interactions and relationships between firms and other institutions, such as educational and research organizations. Firms can no longer be isolated entities; they must embed themselves in dense networks of physical and social capital. Therefore, Chinese firms need to strengthen bonds in three layers of connectivity: firm-to-firm connectivity, firm-to-consumer/supplier connectivity, and machine-to-machine connectivity.

In fact, the network-driven stage affords a great opportunity for Chinese firms to leapfrog other advanced economies. Technologies such as mobile networking, business analytics, and cloud computing help enterprises to improve their productivity. China is investing heavily in digital infrastructure. Early and rapid adoption of these advanced technologies could act as a powerful multiplier. There may be opportunities to avoid the same phases of development that advanced economies went through. The result could be a more rapid closing of the productivity gap between China and advanced nations.
Introduction

China Faces Challenges to Its Future Economic Growth
China’s growth story

Ever since China opened its doors in 1978, the country has witnessed tremendous economic growth. The country’s real gross domestic product (GDP) has surged from less than RMB1.775 billion in 1978 to RMB37.026 billion in 2012 (See Figure 1). Over the last decade alone, the size of China’s economy has almost tripled in real terms. In the global economic league table, China has jumped from 8th in 1980 to 2nd today. In the process, more than 600 million people were taken out of poverty. This is a remarkable achievement for any country, let alone one as geographically large and populous as China.

The business landscape has similarly been transformed. Today, mainland China boasts 85 companies in the Fortune Global 500 list of the world’s largest corporations. Foreign investors have flocked to China’s shores, as many of the world’s largest manufacturers have established operations there. Many of the world’s iconic brands dot the shopping districts of the major cities.

Despite these impressive achievements, there is still plenty of room for catch-up. China’s GDP per head still stands as only one fifth the level in the US (see Figure 2). Furthermore, China now faces several challenges if it is to sustain and accelerate its economic growth—and raise living standards—over the next decade. Externally, China faces a sluggish world economy; domestically, an aging population and rising labor costs. China’s growth to date has been built largely on the twin bedrocks of a growing labor supply and rapid capital accumulation. While these factors will remain important, the next decade of growth must place greater reliance on productivity growth—the ability to get greater output from the existing labor and capital stock.

China’s government policy has emphasized the need to rebalance growth in China, with a focus on raising domestic consumption and living standards. But transitioning to a more advanced and mature economy while maintaining sufficient growth will not be easy. To achieve this feat, China cannot continue with its old development model.

Figure 1 – China’s real GDP, 1980–2012 (at 2005 prices, billions RMB)

Source: Oxford Economics

Figure 2 – GDP per capita (2012)

Source: Oxford Economics
Sources of China’s growth in the past

Our research decomposed China’s GDP growth over the last three decades and assessed the drivers behind it, including labor, capital, and the remaining so-called total factor productivity (TFP), which measures how efficiently labor and capital are used (see “What is total factor productivity?”).

As shown in Figure 3, capital has been the key driver of China’s growth over the last three decades. Capital accumulation accounted for 6.9 percentage points of the 10.5 percent average annual increase in GDP in the last decade, 5.7 percentage points of the 10.1 percent average annual increase in GDP in 1990 to 2002, and 7.2 percentage points of the 9.7 percent average annual increase in GDP in 1979 to 1989.

On the other hand, the contribution of labor is decreasing. It contributed 1.4 percentage points of GDP growth in 1979 to 1989, then dropped to 0.5 percentage points in 1990 to 2002, and 0.3 percentage points in 2003 to 2012.

Now we turn our attention to productivity growth. During the last decade, productivity growth accounted for 3.3 percentage points of the 10.5 percent average annual increase in GDP. This suggests that productivity played a relatively important role in China’s economic growth.

Much of that steady growth in productivity reflects the movement of labor from agriculture to manufacturing (a great improvement in labor allocation but nonetheless not what we want to capture when thinking about productivity). If we discount that effect and only look at the manufacturing and services sectors, we find that labor actually accounted for more of the growth there—the labor boost contributed around 1.5 percentage points to non-agricultural growth across all three periods we studied. Productivity growth accounted for less—about 2.5 percentage points in 1979 to 1989, 4.1 percentage points in 1990 to 2002, and 1.8 percentage points in 2003 to 2012 (see Figure 4).
Productivity is the ratio of output to inputs in production; it thus is a measure of the efficiency of production. Economists agree that long-term, consistent growth will not be sustainable without improvements in productivity. There are various measures of productivity. The measure used in this report is total factor productivity (TFP).

TFP measures the change in how efficiently an economy uses both labor and capital resources to produce output. In other words, higher TFP means that the economy is making smarter and better use of the available labor and capital resources. Economists like to use TFP because it more accurately captures the efficiency gains in the use of both.

What factors lead to an increase in TFP?
TFP captures all the influences on growth except increases in the capital stock and labor supply. Given this, it covers improvements in human capital, the institutional environment, how efficient the allocation of capital is, etc. In the long run, TFP growth depends on innovation and technology advancement, which are vital to sustainable economic and firm growth.

How to calculate TFP at different analysis levels?
In this report, we analyzed TFP at three levels.

Macro-level analysis
We commissioned Oxford Economics to decompose the sources of China’s growth. We used the growth accounting framework based on the Cobb-Douglas production function with constant returns to scale (doubling the usage of capital and labor will also double output). The growth rate of GDP can be decomposed into three factors: labor, capital, and TFP.

Sectoral-level analysis
We commissioned Lombard Street Research to estimate TFP growth at the industry level, using labor, capital, and TFP as the inputs, and gross value added as the output.

Firm-level analysis
We commissioned Profession Heng Yin at Beijing Normal University to use panel data on over 3 million enterprises from the period 1998 to 2009 to identify the factors driving differences in productivity between firms.
The impending labor and capital crunch

In the past three decades, China has enjoyed a large increase in its labor force, with strong growth in the working-age population (the demographic dividend) and migration from the countryside to cities. The migrant-worker population reached 262.6 million in 2012. With urbanization, the workforce shifted from agriculture to more production-oriented sectors, mostly in manufacturing, which has boosted overall productivity.

But as a result of the one-child policy, China’s population growth is slowing. Moreover, the population is aging. The size of the labor force is set to plateau, beginning in 2016 (see Figure 5). A shrinking labor force will be a drag on growth.

In fact, China is already experiencing a labor shortage. Rising wages are hurting China’s labor advantage against other developing countries.

The pace of investment growth is also expected to slow. During the last decade, China relied increasingly on investment to boost its economy. This was obvious during the financial crisis in 2008, when China’s government invested about RMB4 trillion with an eye toward enhancing economic growth.

However, such investment might not be sustainable in the long term. The share of investment in GDP has remained high for the last decade. Policy-makers and scholars from China and around the world agree that China must rebalance its economy toward a consumption-driven development model. This is the overarching goal of China’s Five-Year Plan for 2010–2015. Clearly, China will be looking for other engines besides investment to drive its economic growth.

Figure 5 – China’s labor market (millions)

Sources: Oxford Economics, United Nations
Productivity will be key to driving economic growth in the next decade

What will growth in China look like over the next decade, given that the pace of labor-supply growth and investment is slowing? China will likely find it harder to sustain previous rapid rates of economic growth. Our research suggests that if China wants to lower the investment ratio to below 40 percent of GDP by the end of the next decade while keeping the rate of economic growth above 8 percent (essential for maintaining full employment), it must improve the growth rate of productivity. If the target investment ratio is even lower, then the productivity growth rate will need to be even greater.

In the most optimistic scenario, where GDP growth during the next decade is sustained at the same rate as during the last decade (10.5 percent), annual productivity growth would need to jump from 3.3 percent to 5.6 percent (see Figure 6).

The implications are clear: to offset slowing labor-force growth, China could increase both investment and productivity. But if it wants to rebalance the economy toward consumption while maintaining rapid economic growth, it needs significant improvements in productivity.

Productivity improvement is critical for firms’ financial performance

Not only is productivity important for macroeconomic growth, it is also a major driver of Chinese enterprises’ financial performance. Companies with higher productivity can meet growing obligations to customers, suppliers, workers, shareholders, and the government, and still remain competitive or even improve their competitiveness in the marketplace.

In China, many industries are experiencing pressure on their profit margins, and the situation seems to be related to poor productivity. Our research on Chinese firms’ productivity growth revealed significant sectoral differences. The five-year annualized productivity growth in Chinese firms ranged from as low as -34 percent in industrial metals and mines to as high as 34 percent in the banking sector. Our further analysis revealed that the huge differences between different sectors correlated with their financial performance: productive industries delivered the greatest net profit margins.

Figure 6 – Scenario analysis: How much productivity is needed to drive future growth?

![Scenario analysis chart]

Sources: Oxford Economics, Accenture analysis
China's productivity growth journey

To understand how China can raise its growth rate of productivity, it is important to understand the past phases of China's productivity growth and what its productivity journey could look like in the future.

Reform-led productivity growth: 1978 onwards

Beginning around 1978, the reform-led era focused on bringing about major structural change in China's economy (refer to Figure 4). The significant increase in productivity performance was primarily due to the reallocation of resources, principally labor, to more productive sectors of the economy and through significant capital deepening (more physical capital per worker).

Figure 8 – Labor force as a percentage of sector type

Source: National Bureau of Statistics China
The labor bonanza: 1978 onwards

During this period, a series of reforms in agriculture prompted the exodus of workers from low-productivity primary activities to more productive industry. The increased educational enrollment also resulted in a surge in the skilled labor force. Employment increased from 401.5 million in 1978 to 452.9 million in 1982, 12.9 million people per year. To provide jobs to so many people every year, China decided to develop its labor-intensive industries. This laid the foundation for greater productivity improvement in the next stage.

Machine-led productivity growth: Early 1990s onwards

After Deng Xiaoping’s visit to Shenzhen in 1992, China accelerated its economic reforms. Through institutional reforms to product, capital and labor markets, productive resources were allocated with much greater efficiency across firms and industries. In this stage, substantial investments were directed to purchasing machines and establishing production lines and plants. Labor productivity expanded quickly owing to rapid accumulation of capital per worker (capital deepening). This resulted in greater automation, standardization of tasks, specialization and replication of activities through production lines. Improved production efficiency helped China’s exports increase rapidly, from $78.8 billion in 1992 to $279.6 billion in 2000.

One milestone event in this stage is China joining the World Trade Organization (WTO) in 2001. In the subsequent three years, China revised more than 2,500 laws and regulations, including laws on foreign capital and foreign trade. It also eliminated numerous regulations. All these actions boosted China’s foreign trade, which increased by more than US$200 billion per year since 2002 (See Figure 9). China became the largest recipient of foreign direct investment (FDI) in the world during this stage: From 1978 to the present, the country has absorbed foreign investment of over US$1200 billion (See Figure 10).

Increased economic openness in trade and capital flows enabled China to replicate overseas know how, technologies and best practices directly and also increased competition in China’s domestic markets, which further boosted the country’s productivity growth.

---

**Figure 9 – China’s total import and export since 1992 (US$ billion)**

![Figure 9](source: World Bank)

**Figure 10 – Foreign direct investment in China since 1984 (US$ billion)**

![Figure 10](source: National Bureau of Statistics China)
Firm-centric productivity growth: 2000s–

As the productivity gains associated with the reform-led stage become harder to sustain, productivity growth will come to depend increasingly on the quality of innovation and management expertise at the firm level. Witness the rapid growth in US productivity levels in the 1990s and 2000s in sectors such as retailing. Such growth was driven largely by increased use of information technology in customer analysis and supply chain optimization.

Today, China’s domestic and overseas markets alike are becoming more complex and competitive. Chinese firms are losing their low-cost competitiveness and are under pressure to move up the value chain. Customers and employees are growing more sophisticated and demanding. In this changing business environment, Chinese enterprises capitalized on customer and operational strategy.

Innovation is critical to firm-centric productivity growth. However, China still needs more independent technological innovation. China has almost tripled the share of its GDP devoted to R&D over the past 20 years, from 0.65 percent in 1993 to 1.97 percent in 2012 (see Figure 11), although it still remains below that of the US. This could be attributed to China’s national technology strategy of “market access in exchange for technology.” The strategy stemmed from China’s desire to acquire new technology through technology transfer or FDI, and then assimilate it through learning, imitation, and other means. Chinese firms have realized that they cannot just purchase core technologies; they must also acquire the ability to innovate independently.

Network-driven productivity: Leapfrogging opportunities for Chinese firms in the future

In the next stage, productivity growth in China will come mainly from the clustering of firms in similar or adjacent sectors, physically or virtually. These clusters are even now stimulating innovation, enabling businesses to deepen their expertise and driving product development. Success in this stage will require dense networks of physical and social capital, as well as strong adaptation skills within the workforce. Currently, only a few locations in the world—such as Silicon Valley and other technology clusters—have managed to reach this stage.

Another opportunity that awaits China is in machine-to-machine connectivity, thanks to new digital capabilities that are quickly sweeping every business we know today. The so-called “Industrial Internet” is characterized by hyper-connectivity and interconnectedness among machines, networks, and people. It has arisen through the convergence of industrial systems around the world, enabled by sensors, advanced computing, analytics, and new levels of connectivity permitted by the internet. Machines are becoming networked and generating huge volumes of data that companies can use in real time to improve their business processes and strategies. Resulting benefits include cost savings, faster product development, and superior business intelligence for more informed decision-making.

Adopting the Industrial Internet could put China on a new, more sustainable growth trajectory. China currently is investing heavily in infrastructure. Early and rapid adoption of technologies would ease resource and financial constraints and could act as a powerful multiplier, closing the productivity gap between China and advanced economies.

The development trajectory outlined above has been observed in many countries already. For example, the US went through a stage of initial industrialization supported by a labor boom in the first half of the 19th century. The contribution of labor to GDP growth peaked at 57 percent between 1800 and 1855. This was followed by a take-off stage characterized by a huge accumulation of capital between 1855 and 1890. During those years, the contribution of labor to GDP growth dropped to 28 percent, while the contribution of capital to GDP growth increased from 36 percent to 52 percent. Market expansion stimulated production on a large scale as well as investment in plant and infrastructure. As the US economy matured, growth began to stem more from efficiency gains. Increases in productivity in the later stage of industrialization derived from technology advances and intangible assets.

Figure 11 – R&D expenditure in China (2001–2010) (RMB billion)
One: China’s Labor Crunch
China’s labor dividend has been depleted

China has enjoyed unprecedented economic growth during the past three decades, with annual GDP increases averaging about 10 percent. The country’s seemingly endless labor supply, which accounted for about 25 percent of the total economic growth in 1970s, has fueled China’s economic expansion.10 After 2004, labor shortages and rising wages caused economists to debate whether China was approaching the so-called Lewis Turning Point—the point at which the manufacturing sector has fully absorbed the excess labor from the agricultural sector and industrial labor costs begin to rise sharply. While the debate continues, one thing is certain: China can no longer count on unlimited cheap labor to drive its economic growth.

An aging population and plateauing workforce have depleted China’s labor dividend

While abundant, surplus rural labor has supported China’s extensive growth for many years, the country is on the threshold of a demographic shift that will have profound consequences for future economic growth. United Nations labor force projections suggest that China’s total population will continue to grow, but the working-age segment will expand more slowly than in the past and ultimately begin to shrink.

The share of the population in the 60-plus bracket is set to rise rapidly, from about 12 percent of the population now to over 30 percent in 2050 (See Figure 13).11

Slowing flow of the rural workforce to manufacturing is pushing up labor costs for enterprises

Meanwhile, the flow of workers from rural areas is also diminishing (see Figure 12). For example, the probability of rural laborers shifting to non-farm work increased from 31 percent in 1995 to 60 percent in 2007. The sharpest increase occurred among people in the youngest age group (16 to 20 years old), where the probability increased from 24 percent in 1995 to 98 percent in 2007. Now, the youngest cohorts of laborers feature almost no farmers,12 in effect ending the migration of this cohort from country to city.

One result of these trends is that wages are now rising in China.12 In 2011, the real monthly wage of a Chinese worker reached RMB3,199 (US$495). From 1995 to 2011, the average annual growth rate of real wages was 13.1 percent, exceeding the real GDP growth rate of 9.8 percent (see Figure 14). As a consequence, China is losing its labor-cost advantage compared with other developing countries (see Figure 15).

Table 1 – Proportion of Chinese rural residents working off-farm (millions)

<table>
<thead>
<tr>
<th>Age cohorts</th>
<th>1995</th>
<th>2004</th>
<th>2007</th>
</tr>
</thead>
<tbody>
<tr>
<td>16–20</td>
<td>23.7</td>
<td>74.3</td>
<td>97.7</td>
</tr>
<tr>
<td>21–25</td>
<td>33.6</td>
<td>80.7</td>
<td>86.5</td>
</tr>
<tr>
<td>26–30</td>
<td>28.8</td>
<td>70.5</td>
<td>77.1</td>
</tr>
<tr>
<td>31–35</td>
<td>26.9</td>
<td>62.0</td>
<td>65.6</td>
</tr>
<tr>
<td>36–40</td>
<td>20.5</td>
<td>53.7</td>
<td>73.5</td>
</tr>
<tr>
<td>41–50</td>
<td>20.8</td>
<td>41.5</td>
<td>54.3</td>
</tr>
</tbody>
</table>

Figure 14 – China: Average monthly wages (RMB/month)

Figure 15 – Average monthly wages in China (US$ in average exchange rate)

Sources: ILO Global Wage Database, US Bureau of Economic Analysis, World Bank, Accenture analysis
An overwhelming mismatch in labor markets

Given the evidence cited above, China needs to improve labor productivity. But making that happen is easier said than done. We have identified two sets of obstacles that are preventing labor productivity improvements. The first involves the institutional framework known as the "Hukou" household registration system, which inhibits worker mobility. The second concerns the mismatch of needed versus available skills in the labor market.

Low labor mobility caused by the rigid household registration system

China’s current household registration system increases the transaction costs associated with the mobility of migrant workers. There are many restrictions in the job market attached to individuals’ household registration status. There are still a few number of enterprises, for instance, that refuse to offer non-local workers permanent jobs with adequate provisions for welfare and social security. What’s more, a double standard of sorts exists for local and non-local high school students when it comes to higher education entrance exams. Universities in large cities such as Beijing and Shanghai give preferences to local students by reserving large quotas for them in school admissions. This dual exam system discourages students from other cities from moving to advanced regions to receive their higher education (and to find jobs afterwards).

Academics in China use the term "semi-urbanization" to refer to the situation faced by migrant workers and their families as a result of the household registration system. The underlying debate is whether urbanization should drive economic growth or be a consequence of it. In any case, as the largest source of cheap labor, migrant workers have contributed considerably to China’s economic growth. They are also likely to be a key driving force as the economy rebalances itself to stimulate domestic consumption.

However, unlike their resident city counterparts, migrant workers are not citizens. Thus they lack access to insurance, healthcare, schooling for their children and many other basic rights. As a result, most migrant workers choose to leave the major cities and return to second- and third-tier cities near their homes. This is creating labor shortages in sectors such as manufacturing. The government wants to improve the social standards for migrant workers by giving them citizenship. Yet the public spending required to improve their lot could prove very large. According to China's Treasury Department, the total cost of turning all migrant workers into citizens is estimated at over RMB1.8 trillion (US$0.3 trillion), which would require an additional RMB220 billion in public expenditure every year. The Chinese government has signaled its intention to relax hukou restrictions on settling in small and mid-sized cities, although they will remain in place for large cities. This is a good first step, but more will be needed.

The labor market mismatch is creating pressure

A number of analysts argue that China has a sufficient labor pool for the next 40 years. Indeed, the International Monetary Fund (IMF) estimates that the country’s excess supply of labor—the reserve of unemployed and under employed workers—is currently in the range of 150 million. However, the government is struggling to find ways to match these underutilized workers with appropriate work.

Education/job skill mismatch

China’s current education system has created a persistent mismatch between skills that people learn and those needed by companies. For instance, universities compel college students to focus on theoretical subjects. As a result, graduates lack practical vocational skills and fail to meet employers’ requirements. One measure of this mismatch can be seen in the ratio of number of job vacancies to applicants, which from 2006 to 2011 increased from 0.7 to 1.1, revealing a growing labor-market mismatch. This imbalance will likely worsen in the future. The number of undergraduate and above degree holders (including junior college, college, master and PhD degree holders) grew at a 21% CAGR over 2001-2010. What’s more, China produces the largest number of PhD graduates every year. The number of new PhD holders grew strongly in the early part of the last decade although the growth rate has recently slowed down (see Figure 16).

On the other hand, a 2010 survey shows that the number of employers having difficulties in recruiting general workers increased by nearly 50 percent compared with 2008. This contrast between having too many overqualified graduate students and too few general workers is reflected in the fact that college graduates aged 19–25 have the country’s highest unemployment rate (around 13 percent).
Figure 16 – Growth of undergraduate and postgraduate degree holders in China

Percentage

Increase in number of people with undergraduate degree and above
Growth rate of people with undergraduate degree and above
Growth rate of people with PhD degree

Sources: ILO Global Wage Database, US Bureau of Economic Analysis, World Bank, Accenture analysis

Figure 17 – Demographic mismatch in different age groups, ages 25 to 34 and 45 to 64

Accumulated amount

Note: Job vacancy number and the registered job seeker number are reported by MOHRSS.
Sources: China Human Resources Market Information Monitoring Center, MOHRSS of the People’s Republic of China, Accenture analysis
Investment in fixed assets—roads, buildings, machinery, and other infrastructure, has powered China’s economy for the last two decades. It has driven success in manufacturing export markets and has transformed the physical face of China. At the same time, many commentators worry that China’s growth model relies too heavily on increasingly inefficient investments and that, as a result, its economy has become unbalanced. To sustain growth rates of 8 percent or higher, they argue, China must shift its economy toward consumption-led growth.

While seemingly compelling, the conventional over-investment story is misleading in certain respects. Our research shows that capital will continue to be a main driver of China’s growth in the coming decade. However, the key issue facing China will not be the volume of capital in play, but its distribution and how it is used. In fact, investments in the right areas can stimulate household consumption and provide an entirely new source of balanced growth.
Fixed investment, important but gone too far?

China’s remarkable economic growth over the past decade has relied prominently on investment in fixed assets, which rose to 45 percent of GDP in 2012 from less than 30 percent in 1980. The RMB4 trillion stimulus package that China injected into the economy during the international financial crisis resulted in a 26 percent jump in urban fixed-asset investment in 2009.20 Even taking into account the size of China’s population, the country has accumulated capital at a staggering rate. For example, the nation’s rate of capital deepening, or capital growth per person, has increased faster than in any other major economy during the past two decades. Capital deepening reached levels similar to those of other high-growth East Asian economies during their earlier rapid growth periods. Between 1981 and 1990, China’s capital stock per person grew 9.5 percent per year, markedly faster than in other economies. And in recent years, the pace has increased: in the latest decades, China’s capital stock per capita grew by over 11 percent a year (see Figure 18).

As a consequence, China’s fixed investment has contributed substantially to its real GDP growth, accounting for 6.9 percentage points of the 10.5 percent average annual increase in the last decade and 5.7 percentage points of the 10.1 percent increase during 1990–2002. What’s more, capital’s role has increased in recent years as labor growth and productivity growth have slowed (see Figure 19).

Source: Oxford Economics
However, many commentators now argue that this flood of capital has caused China’s economy to become dangerously unbalanced. As evidence, they point to the fact that since 2003 investment has made up 40 percent or more of China’s GDP. At the same time, the share of household consumption plunged as cutbacks in public education, health, and housing services caused people to spend more cautiously (see Figure 20).

Today, investment stands at 44 percent of China’s GDP. This share is much higher than those of the other BRIC nations (Brazil, Russia, and India) and developed economies (see Figure 21).

Some analysts point to oversupply in property markets, low prices, and excess capacity in certain industries as further evidence of a capital spending glut. They mention numerous cases of over-construction in real estate, the largest source of investment growth. Another example is the steel industry, which suffered from excess capacity after the 2008 economic stimulus package.

As a result, many experts and Western governments have raised doubts about the sustainability of the investment-driven economic growth model. They say that China is overinvesting and heading for a crash. A leading proponent of this viewpoint is hedge fund manager James Chanos, who points to staggering debt and numerous real estate investments that developers have been unable to sell. An analysis by Standard & Poor in 2013 stated that China has the highest risk of a downturn among 32 of the world’s largest economies because of its overreliance on investment to drive GDP growth, a position supported in a recent paper by the IMF. While investment may be the bedrock of China’s economic growth, experts worry that it could also become the nation’s Achilles’ heel.
Counterpoint:
Investment volume is not a problem in itself

The view that China is dangerously addicted to fixed investment seems compelling. But on closer examination, some key indicators relating to China’s capital stock appear to be at odds with the conventional over-investment story. At the very least, they indicate a more complex picture in which the key challenges relate to the distribution and use of capital rather than to volume alone.

We now look at these indicators in turn.

Incremental capital to output ratio

The incremental capital to output ratio (ICOR) is defined as the amount of capital needed to produce an additional unit of output. It measures how efficiently an economy uses capital to create goods and services. A low ICOR indicates a relatively efficient use of capital: fairly low capital expenditure is needed to produce additional output. By contrast, a high ICOR suggests that higher levels of investment are needed to produce the same level of output. An economy’s ICOR can be volatile over time and is often subject to swings in investment and output cycles. On the whole, however, ICOR should increase over time as economies mature, owing to diminishing returns to capital.

While China’s ICOR has recently edged up, it has been fairly stable over the past decade. Although the ICOR fluctuates year to year, over a longer time frame we see the trend line of ICOR is not that steep (see Figure 22). In other words, at an aggregate economy level, China has seen some deterioration in the efficiency of investment but not dramatically so.

From an international perspective, China’s ICOR levels today are also not out of kilter with those of other Asian economies during their rapid growth phase. For example, South Korea and Singapore had ICORs in the range of 3.2 to 4.1 during the period 1975-1980. These numbers suggest that China’s capital efficiency is comparable to those of South Korea and Singapore when those countries were in their rapid growth phases.

Amount of capital per capita

The amount of capital per person in China can be loosely understood as the number of tools available to each worker. The higher the amount of capital available to each person, the more the economy—and each person on average—can produce. Note, though, that the effect diminishes the higher the level of capital per capita.

China’s amount of capital per person appears to contradict the idea that China is awash with capital. While capital per person has risen steadily over the last few years, it remains far below the levels seen in developed economies such as the US and Japan. In fact, it is only about 10 percent that of the US (see Figure 23). On this reading, China has plenty more room to accumulate capital.

Is China putting too much of its resources into capital accumulation? The ICOR and level of capital per person suggest that the answer is no. China continues to deliver a high return on its investments and has a long way to go before maturity. In short, our research strongly suggests that capital will continue to be an important source of economic growth for China.
Figure 22 – ICOR in China (1978–2011)

Figure 23 – Capital per capita across countries (1980–2011) (US$1,000, 2010)

Table 2 – ICOR in selected countries (1975–2011)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>China</td>
<td>4.4</td>
<td>5.1</td>
<td>4.7</td>
<td>5.2</td>
<td>3.0</td>
<td>3.7</td>
<td>3.5</td>
<td>4.3</td>
</tr>
<tr>
<td>US</td>
<td>49.8</td>
<td>4.3</td>
<td>5.1</td>
<td>9.2</td>
<td>4.4</td>
<td>5.0</td>
<td>4.9</td>
<td>9.9</td>
</tr>
<tr>
<td>UK</td>
<td>18.3</td>
<td>3.9</td>
<td>9.2</td>
<td>21.2</td>
<td>5.5</td>
<td>6.0</td>
<td>5.5</td>
<td>9.0</td>
</tr>
<tr>
<td>Japan</td>
<td>20.2</td>
<td>3.4</td>
<td>4.5</td>
<td>(27.7)</td>
<td>6.1</td>
<td>7.0</td>
<td>45.7</td>
<td>38.2</td>
</tr>
<tr>
<td>South Korea</td>
<td>11.7</td>
<td>81.3</td>
<td>4.3</td>
<td>7.0</td>
<td>3.2</td>
<td>3.4</td>
<td>5.4</td>
<td>7.2</td>
</tr>
<tr>
<td>Singapore</td>
<td>16.4</td>
<td>(27.3)</td>
<td>2.0</td>
<td>5.3</td>
<td>4.1</td>
<td>4.0</td>
<td>6.6</td>
<td>6.0</td>
</tr>
</tbody>
</table>

Note: Negative values indicate that real GDP declined compared with the previous year. Averages are calculated as trimmed means (i.e. with the high values—including negative numbers—and low values removed).

Source: World Bank

Note: ICOR measures the amount of capital needed to produce a unit of output.

Source: World Bank

Source: World Bank
What is China’s real capital crisis? The distribution of capital

How do we reconcile the conventional story of overinvestment with some of the other indicators? To resolve this contradiction, we need to look beyond the aggregate economy level to the sectoral level. A new picture emerges: China’s real capital crisis lies in how the capital is distributed.

Returns on assets vary greatly at the sectoral level

One sign that capital is misallocated in China can be found when we look at each industry’s return on assets (ROA) (see Figure 24). The ROA tells us how well a sector is generating profits with its total assets, which is a variation of capital.

ROA generally varies widely by industry, depending on whether the business is very capital intensive or not. So we compare instead each sector’s change in ROA. Each sector’s ROA change indicates its relative ability to improve how much it squeezes out of the same amount of assets. The banking, pharmaceuticals, and oil and gas industries enjoyed great improvement in asset profitability over the last 10 years, whereas construction, real estate, and insurance saw ROA decline. These findings suggest potential constraints on the distribution of capital that inhibit the flow of adequate financing to the most productive sectors and industries.

Disparities between SOEs versus private enterprises, as well as between SMEs versus large enterprises (usually having some state ownership), also point to the need for better distribution of capital. ROA data show that, on average, private enterprises are able to generate a much higher ROA than SOEs (see Figure 25). This means that capital could be better utilized by private firms. A research paper has found that a decrease in the SOE share of fixed investment by one percentage point was associated with an increase in GDP per capita growth of 0.13 percentage points. By contrast, an increase of one percentage point in private-sector investment was associated with an increased growth rate of 0.20 percentage points.20

\[\text{Figure 24 – Sectors’ 10-year change in ROA in China (2002–2012)}\]

\[\text{Figure 25 – Return on assets for Chinese industrial enterprises, by ownership (2001–2012)}\]
Similarly, a difference in capital efficiency can also be found between China’s SMEs and large industrial enterprises (See Figure 26). This tells us that capital could be better distributed to smaller firms, not least because they can generate better returns and are playing a critical role in the economy. Sadly, SMEs remain starved of adequate funding. Small enterprises accounted for just 8.5 percent of RMB7.1 trillion in long-term loans in 2009. In a 2011 survey of SMEs commissioned by the Ministry of Industry and Information Technology and Renmin University of China, more than half of the respondents said that funding is a “more difficult” or “very difficult” problem. A large portion of SME financing tends to come from owners, and their friends and families.

Significant investment still needed in infrastructure

Review of China’s infrastructural investments also shows that more targeted allocation is needed. Take the example of transportation. Though China has made impressive strides in high-speed railway, it still needs to invest more in upgrading essential bus services and local railways networks. China is nearly the same size as the US, yet its total railway length is less than 30 percent the size of the US system. Similarly, China’s road density remains well behind that of mature economies (See Figure 27).
One of the most talked-about challenges facing China’s financial sector may be its high levels of non-performing loans (NPLs). The issues surrounding the functioning of China’s financial system are complex, and the government has made much progress in restructuring the country’s big banks, ensuring their continued solvency and keeping inflation in check. But these efforts have had an unintended consequence: they make it very difficult for private SMEs to obtain funding. Even though SMEs are widely recognized as key players in China’s diversifying economy, they remain shut out of the main financial markets because of their high risk profiles. Their small-scale, weak economic foundations and short lifecycles make it difficult for them to meet the high threshold requirements of credit financing markets. High rates of NPLs discourage lending to SMEs because the cost of evaluating an SME can be five times greater than for a large enterprise.

Effectively managing risk is a fundamental challenge for China’s financial system. The commercial banking sector needs a credit bureau and a strategy to evaluate SMEs, government public works projects, and social programs to distinguish between worthwhile investments and bad ones. We believe that state-owned and mixed banks can turn the ongoing restructuring process into a competitive advantage—an opportunity to realize strong returns from investing wisely in profitable ventures.

The Chinese government has rightly begun to recognize SMEs’ important role in the country’s economic development. Moreover, the 1,000-plus SME-oriented industrial zones have dramatically reduced their start-up costs and risks. China could see even greater economic prosperity by stepping up these efforts.
Three: The Path to Productivity Growth

China’s future economic success cannot rest on labor and capital alone. What ultimately drives faster growth and rising living standards is productivity—the ability to organize existing resources to get more output. Here China presents a paradox. While China’s overall productivity growth has been decent, many sectors and firms appear to be struggling. Research results show us the net profit margin change for 19 sectors in the past five and 10 years. Fifteen of the industries have seen their profitability deteriorate severely in the last five years, while 11 suffered the same misery in the past decade (see Figure 28). To see what’s going on, we looked at China’s productivity performance though three lenses: macro, sectoral and firm.
Figure 28 – Net profit margin change for 19 sectors, 5-year and 10-year

Source: Lombard Street Research
Figure 29 – China’s productivity growth rate and its contribution to GDP

Figure 30 – Annualized productivity growth rate (1990–2010)

Figure 31 – Labor productivity (2012) (US$)

Lens 1: At the macro-level, China’s productivity performance has plenty of room to improve

China’s productivity growth at the macro-level has been very impressive over the past decades, especially in the 1990s. The Southern Tour Speech by Deng Xiaoping, the prologue to China’s economic reform, injected new energy into China’s economic development. The annualized productivity growth rate in 1990–2002 jumped to 3.9 percent, up from 1.1 percent in 1979–1989. The growth rate of productivity slightly decreased to 3.3 percent in the last period (2003–2012) and will drop further to 2.5 percent in the next decade (2013–2022), according to our projections. However, we can hardly ignore its tremendous contribution to China’s GDP growth, which accounts for 31.4 percent and 34.3 percent of China’s GDP growth in 2003–2012 and 2013–2022 respectively (see Figure 29).

China’s productivity growth, a key driver for economic growth, is far ahead of most other countries in the world. Take the comparison between China and the developed countries, particularly the US and Japan. During 1990–2010, China’s annualized average productivity growth rate was 2.8 percent, far greater than that of the US and Japan (0.5 percent and 0.2 percent respectively). China’s rate was greater than even that of Korea, which has the best record for its productivity performance among developed countries. China’s productivity record has also surpassed those of the other BRIC nations: Brazil (0 percent), Russia (1.7 percent) and India (nearly 2 percent) (see Figure 30).

However, there’s another side to this current prosperity. China’s notable productivity achievement reflects its fast growth rate, which is based on a low starting point. To see if China has caught up with other economies, we must look at the absolute level of productivity that they are operating at. So we look at labor productivity, which is a simple measure of a country’s output per employed person. As Figure 31 shows, things look quite different. China’s labor productivity is far behind that of the US, South Korea and Japan.
Lens 2: At the sectoral level, productivity growth shows huge disparities across sectors

To examine China’s economic performance at the sector level, we looked at sales per employee, which can be viewed as another form of labor productivity. We found that China’s productivity has lagged behind that of other emerging markets and the US. Most disturbing is the huge productivity gap in some high-tech sectors between China and the US, such as technology, pharmaceuticals and telecommunications. Sales per employee for these three sectors in China are only between a quarter and a third of those in the same sectors in the US.35

Now let’s look at TFP across these sectors. China’s sectors differ greatly in their efficiency gains of the past five years, which might be considered an alarming signal of development imbalance. For example, tertiary sectors, such as banking, recreational services, media, insurance, and travel and leisure, displayed strong productivity growth in the past five years. But some secondary sectors, such as industrial machinery, electronics/electronic equipment, and utilities, which used to be the economic backbone of China’s economy, had poor productivity performance in the last five years.

Figure 32 – Sales per employee in China versus emerging markets and the US (2012) (US$)

Note: Emerging markets include China, India, Russia and Brazil.
Sources: Lombard Street Research, Accenture analysis
Ten out of the 19 sectors we looked at have experienced positive productivity growth in the last five years, with banking at the top (34.5 percent). The remaining nine sectors failed this examination, with industrial metals and mines showing the worst performance (-33.9 percent). One reason for this disparity might be that the different sectors have been going through different stages in their industry lifecycle. Another reason might be the different degrees of competition across sectors. For instance, the clothing and accessories sector, notorious for its low entry barrier and fierce competition, has experienced annualized productivity growth at 11 percent in the last five years, while real estate and industrial metals and mines, characterized by an extremely high entry threshold and more policy dividends, have the worst productivity performance. In addition, there may be different degrees of resource availability across sectors. Some sectors have ready access to land or financial support, while others do not.

The key point is that these disparities could threaten China’s economic balance if the country cannot drive productivity improvements in a more balanced way across sectors. We believe productivity growth should be a top-of-mind concern for every industry player and investor, not least because it tends to lead to higher profit margins (see Figure 34).

![Figure 33 – China’s TFP by sector (5-year annualized)](source: Lombard Street Research)

![Figure 34 – Productivity growth and net profit margin at the sectoral level](source: Lombard Street Research)
Lens 3: Productivity disparities continue at the firm level

Now we turn to the last lens: firm-level productivity. Although China has made remarkable improvements in productivity growth at the macro-level, there are distinctive disparities in productivity levels between firms. Accenture commissioned Professor Heng Yin from Beijing Normal University to use his econometric model to measure firm-level productivity and to identify some of its drivers.36

Within industries, firms perform differently when it comes to achieving productivity gains. We use percentile ratios to show the productivity dispersion between firms—this is the ratio between firm productivity at the 25th percentile over firm productivity at the 75th percentile. The dispersion of productivity value among firms is quite significant at an average of 1.16. The tobacco, beverage manufacturing, pharmaceutical, non-metallic minerals product, and food manufacturing industries show the most variation (see Figure 35).

The gap between the massive productivity growth at the macro-level and the struggles confronting many Chinese firms seeking to improve their productivity indicates a lack of understanding of the drivers behind differences in productivity performance at the firm level. We identify five major drivers of these differences, which we discuss in the sections that follow.

Figure 35 – Productivity disparities at firm level across industries

Now we turn to the last lens: firm-level productivity. Although China has made remarkable improvements in productivity growth at the macro-level, there are distinctive disparities in productivity levels between firms. Accenture commissioned Professor Heng Yin from Beijing Normal University to use his econometric model to measure firm-level productivity and to identify some of its drivers.36

Within industries, firms perform differently when it comes to achieving productivity gains. We use percentile ratios to show the productivity dispersion between firms—this is the ratio between firm productivity at the 25th percentile over firm productivity at the 75th percentile. The dispersion of productivity value among firms is quite significant at an average of 1.16. The tobacco, beverage manufacturing, pharmaceutical, non-metallic minerals product, and food manufacturing industries show the most variation (see Figure 35).

The gap between the massive productivity growth at the macro-level and the struggles confronting many Chinese firms seeking to improve their productivity indicates a lack of understanding of the drivers behind differences in productivity performance at the firm level. We identify five major drivers of these differences, which we discuss in the sections that follow.
Four major levers drive the differences in productivity between high-performing firms and low-performing firms.

In China, institutional reforms at the macro-level will boost firm-level productivity through diversified ownership. But there are four additional drivers of this important metric (see Figure 36). These are R&D, technology, firm size, and internationalization.

Figure 36 – Effects of four levers on firm-level productivity

- Productivity elasticity with respect to firm scale measures the percentage difference in productivity between small enterprises and large enterprises.
- Productivity elasticity with respect to technology measures the percentage difference in productivity between firms that have information technology (computers) and firms that do not.
- Productivity elasticity with respect to R&D measures the percentage difference in productivity between firms that invest in R&D and firms that do not.
- Productivity elasticity with respect to internationalization measures the percentage difference in productivity between firms that export and firms that do not.

Source: Accenture analysis
R&D expenditure and productivity

Overall, China spends less on R&D compared with other developed nations. In 2011, the share of GDP in R&D in China was only 1.8 percent, compared with 2.8 percent in the US. This is partly due to where the economy is at in its development stage. China is in the intermediate stage of industrialization. The main areas of development are basic consumer goods, housing, infrastructure such as roads and railways, and products made in the heavy machinery and chemical industries, all of which are material-intensive and have low technological content.

However, Chinese businesses have stepped up their R&D expenditures. From 2000 to 2009, the annual average growth rate of firms’ R&D spending was 25.5 percent, higher than that of other entities such as research institutes and universities, which were 16.2 percent and 22.3 percent respectively. R&D spending in medium- to large-sized companies increased from RMB44.2 billion in 2001 to RMB599.4 billion in 2011 (see Figure 37). During China’s 12th Five-Year Plan period, the share of R&D is expected to account for 2.2 percent of total GDP.

At the firm-level, differences in attitudes toward R&D activities affect enterprise productivity. In 26 out of 29 of the industries we examined, R&D activities boosted firms’ output growth by 1.8 percentage points, on average (see Figure 38). The more the spending on R&D, the higher the productivity level we observed.
Technology and productivity

Chinese enterprises have benefited greatly from importing advanced technologies (such as machinery, computers and software systems) from developed countries. For example, enterprise IT systems helped companies streamline their business processes. Our analysis shows that companies that leverage technology grow their productivity 2.8 percentage points faster than firms that do not (see Figure 39).

To further improve productivity, Chinese companies need to invest more in assimilating the technologies they have purchased. During the past five years, average expenditure on absorbing and adapting imported technologies has been less than 20 percent of total spending on technological importation among medium- and large-sized enterprises (see Figure 40). The average figure for members of the Organization for Economic Co-operation and Development (OECD) is 33 percent. Other Asian countries, such as Japan and Korea in 1970 and 1980s, invested two to three times as much in absorbing and localizing imported technologies as they did in purchasing foreign equipment.

Looking forward, technology will help Chinese enterprises not only manage their resources but also reach target markets and consumers. New digital technologies such as cloud computing, business analytics, and mobile networking offer huge potential to boost firms’ productivity. Many companies in China have already taken steps to engage customers in new ways, through multiple digital channels. In a recent Accenture survey, 43 percent of respondent firms said they use cloud computing, and 88 percent anticipated using cloud computing in two years’ time. The share of expenditure on cloud computing is currently lower in China, accounting for 6.3 percent of information technology budgets. Contrast that with 13.2 percent and 17 percent respectively, in the US and countries outside of China.

Figure 39 – Impact of the use of technology on firm-level productivity

<table>
<thead>
<tr>
<th>Industry (NAICS)</th>
<th>% increase in productivity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Printing and Recording Media Reproducing</td>
<td>4.50</td>
</tr>
<tr>
<td>Instrument, Meter, Stationery and Office Machine Manufacturing</td>
<td>4.42</td>
</tr>
<tr>
<td>Nonmetallic Minerals Products</td>
<td>3.31</td>
</tr>
<tr>
<td>Petroleum Processing and Coking Plant Industry</td>
<td>2.77</td>
</tr>
<tr>
<td>Food Manufacturing</td>
<td>2.46</td>
</tr>
<tr>
<td>Transportation Equipment Manufacturing</td>
<td>2.42</td>
</tr>
<tr>
<td>Agricultural and By-Product Processing</td>
<td>1.97</td>
</tr>
<tr>
<td>Ferrous Metal Smelting and Rolling Processing</td>
<td>1.41</td>
</tr>
<tr>
<td>Wood Processing, and Other Wood Products</td>
<td>1.33</td>
</tr>
<tr>
<td>Paper Making &amp; Paper Products Industry</td>
<td>1.20</td>
</tr>
<tr>
<td>Electronic Machinery and Equipment</td>
<td>1.19</td>
</tr>
<tr>
<td>Chemical Materials &amp; Products Manufacturing</td>
<td>1.17</td>
</tr>
</tbody>
</table>

Note: The productivity elasticity with respect to information technology is used to measure the percentage increase in productivity between firms that have information technology (computers) and those that do not.

Source: Accenture analysis

Figure 40 – China expenditure for technology acquisition

Expenditure for assimilation of technology (RMB billion) percentage
Expenditure for acquisition of technology (RMB billion)
Ratio of expenditure for assimilation of technology to total expenditure (percentage)

Sources: China Statistical Yearbook, Accenture analysis
Firm scale and productivity

SMEs have made a remarkable contribution to China’s economic growth in the past, accounting for around 60 percent of China’s GDP and 80 percent of employment. However, our research shows that larger firms are more productive with its resources, because size confers access to physical, social and financial capital that small firms often lack.

A significant portion of small companies must overcome the growth threshold where firm scale starts exerting an impact on productivity. Scale will enable Chinese enterprises to lower their long-term costs and to achieve synergies in their use of resources. Generally, the larger the firm, the higher their productivity in the companies we studied (see Figure 41).

Having a capital network can help companies secure the funding they need to grow. That’s because firms that proactively build such a network will earn the trust of participants in the network.

Figure 41 – Impact of scale on firm-level productivity

Note: The productivity elasticity with respect to firm scale is used to measure the percentage increase in productivity between medium-large enterprises and small enterprises.

Source: Accenture analysis
Internationalization and productivity

Internationalization has also contributed to many Chinese firms' growth and development. For one thing, having access to global consumers and entering new markets help to diversify a company's revenue sources. In addition, foreign leading companies can serve as role models for innovation within domestic Chinese firms, which in turn can strengthen the local innovation system as a whole. The technology upgrading and knowledge spillover through interactions with companies in the open global market improves the productivity levels in Chinese enterprises overall.

Research shows that the greater the portion of a company's products that are exported, the higher the company's productivity. On average, the ability to export even part of one's products boosts firms' growth rate by an additional 1.85 percentage points (see Figure 42).

Entering global markets through innovative sales channels and selling more value-added products will be critical for driving Chinese enterprises' competitiveness on the world stage in the coming decades. To keep pace with the world's leading firms and excel in the global marketplace, Chinese companies will need to forge links with foreign firms and with local suppliers and consumers. Such links will help to accelerate the technology and knowledge spillovers that are such valuable benefits of internationalization.

Besides the four major levers that drives the differences of firm-level productivity, there are two additional levers that we have identified as influencing Chinese firms' productivity performance.

Ownership structure and productivity

Over the past 30 years, institutional reform has helped to improve productivity in Chinese companies. Such reform has included the easing of constraints on firm ownership, which has stimulated efforts to optimize companies' efficiency. Varying the types of ownership has also intensified competition between local firms, which further boosts their productivity.
Take the manufacturing industry. On average, having a private ownership structure increases growth by 3 percentage points. In the pharmaceuticals industry, private ownership enhances productivity by 4.5 percentage points. And foreign ownership increases productivity by 3.7 percentage points (see Figure 43).

**Clustering and productivity**

Location matters. Information flows easily among firms that congregate in the same locality, and that fosters knowledge spillover between them. Apart from the traditional benefit that clustering generates, it creates a major advantage in the form of innovation. The environment and culture that develops around a cluster of companies stimulates creativity and innovation, which is key to driving productivity growth.

Consider the high-tech cluster in Hsinchu Science Park, Taiwan. The cluster is home to Taiwan’s world-renowned semiconductor and computer firms. Its dynamic, random-access memory production capacity ranked number one in the world and accounted for 23 percent of the world’s total capacity in the early 2000s.

To sum up, R&D investment, savvy use of technology, scale, internationalization, firm ownership structure, and clustering all affect Chinese companies’ productivity outcomes. Enterprises seeking to reach their productivity potential and achieve sustainable growth in the next decade and beyond would do well to activate these drivers. They are not solutions in and to themselves; instead, they point to more fundamental changes that must occur to achieve greater productivity.

In this chapter, we’ve investigated the productivity of China’s economy as a whole, its industries as well as individual firms. In the next chapter, we take a closer look at the broad policy and business implications for improving economy-wide productivity. The chapter after that, we focus on how enterprises can improve their own productivity and profitability.
The Power of Three: From Quantity to Quality
Pressing the stimulus button every time a crisis arises is not a sustainable way to maintain rapid economic growth. China has to redesign its economic engine at the core. As our investigation of the factors of production—labor, capital and productivity—shows, the time has come for China to focus more strategically on quality improvements instead of quantity boosts.

Moving from labor to talent

Our research has shown that the country is losing its labor-based source of competitive advantage because of rising labor costs. As a result, it is now all the more important for China to improve workers’ skills in order to offset the slowing growth of the labor-force.

Reform of Hukou is on the government’s agenda. Following the recent Third Plenum of the Central Committee, the Chinese government has signaled its intention to relax Hukou restrictions on settlement in small and mid-sized cities, although they will remain in place for large cities. This is a good first step, but more will be needed.

Improve labor-force participation

There are large segments of underutilized workers in China, such as retired soldiers, retired athletes, people with health problems and women. If China can improve the participation of such workers in the labor force, it can maximize the use of workers’ skills. In recent decades, many Chinese businesses cut retirement expenses by laying off people who were approaching their 50s. But in 2003, the Chinese government realized that social unrest was being spawned by large numbers of unemployed people. So the state council defined new policies to encourage re-employment of such individuals. These policies included financial subsidies for individual entrepreneurs (qualified individuals are eligible for reduced loan rates for launching start-up businesses) and tax incentives and social security subsidies to enterprises which absorb unemployed people (qualified enterprises are eligible for reduced income tax and corporate tax rates for the first three years). These moves were helpful, but there are still 11 million retired soldiers, laid-off workers and registered unemployed persons in China’s 12th Five-Year Plan period.

China needs to reform its household registration policy to encourage a free flow of skilled workers. As we argued earlier in this report, the rigid system and lack of social security for migrant workers have increased transaction costs and hampered the mobility of labor. China needs a broader social safety net that offers more comprehensive health, education, and social security services to migrant workers and their families.

Understand labor-force participation challenges

In many developed countries, government policies provide second-chance options for low-skilled adults. Some options consist of courses that teach new skills but that require only a few hours per week. Others combine language learning with on-site work assignments. There are also tax incentives that aim to attract more women or disabled or older people back to the labor market. Changes to pension schemes can also encourage people to keep working instead of retiring.

In China, business leaders need to change their attitudes toward groups often marginalized from the labor force, especially women, older people and individuals with health problems. Educational institutions and enterprises must make an effort to provide lifelong learning programs to equip members of the older generation with skills that will help keep them competitive in the labor market.

Apprenticeships constitute one vehicle for accomplishing this. Through apprenticeships, workers gain part-time on-site training in a company, backed by classroom instruction in a vocational school, with the goal of becoming certified in a profession after a period of years. Apprentices not only strengthen their qualifications for employment; they also bring new knowledge and fresh perspectives to the enterprises that employ them, which is especially important for small firms.

Address skills mismatches

There are mismatches between needed and available skills in China’s labor market. The country will have to invest in education to solve the problem. Better planning and forecasting could help.

China needs more people with broader, more practical skill sets. Qualifications and theoretical knowledge alone are not sufficient to operate in today’s complex workplace. “Hard” skills such as technical competencies are no longer enough to deliver satisfactory products and services efficiently. “Softer” skills are also needed, such as innovation, creativity, and business sense.

Vocational schools and private educational institutions can play a major role in providing the training needed to qualify workers for job opportunities. Media, students’ parents, and conventional education authorities can help by explaining the value of vocational training and ensuring that students acquire the practical skills such training offers. Government, for its part, can improve the quality of adult education and training institutes by setting sufficiently high standards and establishing performance evaluations.

As mentioned before, apprenticeships can be a useful first step to combining work with education. This dual-track approach can be a valuable alternative for both enterprises and employees. Apprenticeships can give businesses the opportunity to assess potential employees’ capacities in real-life situations and make future recruiting decisions, while also educating apprentices on the enterprise’s needs, values, and culture. In addition, apprenticeships help trainees develop key soft skills such as communication, entrepreneurship, problem-solving and teamwork. In 2009, the European Union had as many as 3.7 million students taking part in apprenticeship programs.

The apprenticeship model has been largely promoted in non-traditional sectors in
recent years. For instance, London—which is overwhelmingly dominated by the service sector—has one of the highest unemployment rates in the UK. The new coalition government has adopted a more market-based approach to skills development, shifting more funds to support apprenticeships. The number of apprenticeships in London doubled from 20,000 in 2009 to 40,000 in 2010 through the mayor’s apprenticeship campaign. This model has proved successful in reducing unemployment in many other developed countries, such as Austria, Germany, Switzerland, and the Netherlands, as well as in developing countries.46

Invest in high-end skills

There’s an extensive buzz these days about the development of STEM talent—people who possess strong science, technology, engineering, and math skills. These are the knowledge workers who turn the wheel of the global, technology-driven economy. Fortunately, China is faring well in the production of university graduates majoring in STEM fields. In China, 41 percent of all new university degrees awarded are in science and engineering. In the US, that figure is only 13 percent; it is 22 percent in the UK. The number of new engineering PhDs that China awards grows by 7.3 percent every year. In fact, we believe that China has great potential to be a net supplier (exporter) of global STEM talent in the future.47

However, even though China’s STEM graduates demonstrate exceptional technical skills, many lack the business knowledge needed to deploy those skills effectively in an organization. So China needs to embrace a more comprehensive system that provides training on both technical skills and business knowledge.

Making capital count

As with labor, when it comes to capital, China must do much more than just accumulate more capital to sustain growth. To maintain its rapid economic growth in the coming decade and shift from investment-led growth to consumption-led growth, the country will need to ensure that investments are channeled to places that enable innovation to take off.

What kinds of investments would generate the best returns in the long run? We believe they include those that help small private businesses, raise living standards for the middle class and working poor, and build the country’s knowledge and digital capital. The country could also make high-return investments in organizational decision-making, sustainability, and profitability to improve processes and increase capital productivity. In other words, China needs to put its enterprises—small and large—on the road to high performance. Organizations must ensure that their money is spent wisely—on improving people’s livelihoods and stimulating business activity. Investments in technology and infrastructure must work in concert with business growth.

Support small- to medium-sized enterprises

China’s SMEs provide over 80 percent of the urban jobs available each year and are responsible for over 75 percent of the country’s enterprise technological innovation. Despite their central role, these enterprises remain starved of adequate funding. In addition, SMEs have less access to information resources, which hinders their innovation efforts. Finally, they get last pick of the country’s talent.48

By supporting the growth and development of SMEs through a better allocation of capital, China could see even greater rates of technological innovation and economic prosperity. The country’s more than 1,000 SME-oriented industrial zones have been crucial in reducing start-up costs and risks for SMEs, and China could benefit hugely by increasing these efforts.49

Provide infrastructure to develop smaller cities and towns

While many gaps exist in China’s networks of transportation, housing, and utilities systems, they are not caused by a lack of funding in those areas.50 Instead, the issue is the unbalanced distribution of infrastructural investments.

In line with the Chinese government’s vision for harmonious growth, we believe that more capital ought to go toward developing and connecting China’s second-tier, third-tier and fourth-tier cities while improving the livelihoods of migrant workers in its top-tier urban centers. By targeting investments toward inclusive growth, the country could improve the livelihoods of its entire workforce and sustainably raise domestic consumption, which could help rebalance the economy.

Leverage information and communication technologies

Information and communication technologies represent the third important investment area needed to make widespread innovation happen within China. ICT has played a relatively minor role in China’s capital story to date, compared with those of mature economies. However, China has the opportunity to leapfrog other economies by applying ICT—making the most of mobile, social, data and cloud technologies—to all of the engines of its economy, from agriculture to government to education.

How can government and industry players act now? Well, it starts with modernizing and digitizing existing processes. To truly leapfrog though, one must envision and execute entirely new digital business models. China can import all the latest ideas of this fascinating digital business era, but if they hope to reach new heights, they must become innovators themselves. An analysis of the development histories of other countries reveals that, in the long run, technological innovation, especially in ICT, requires investment in basic R&D as well as education, particularly in STEM knowledge and skills, from primary school to higher education. Proper incentives are needed to encourage these steps.

Enhance decision-making quality with analytics

Lastly, we cannot emphasize enough the important of analytics in making capital count. Analytics refers to the statistical and information-modeling techniques used to garner insights from vast volumes of data. By harnessing the power of analytics and other new digital capabilities and practices, the government will be able to greatly improve policy outcomes. For example, analytics can help the government to make better capital allocation decisions based on social returns, and to achieve better matching in labor markets.
Promoting efficiency and innovation for long-term growth

As China's economy matures, productivity will play a critical role in driving the country's economic growth. In the long run, China needs to deepen its economic reforms to facilitate efficiency and innovation.

Deepen reform to increase factor market efficiency

China is entering a new phase of reform. To complete the transition to a market economy and further strengthen its economic growth, the nation must make more of an effort to deregulate its factor markets. To that end, China needs to accelerate the transition of government's function. Reducing direct governmental interference or participation in microeconomic activity is an important step toward improving efficiency and productivity in the economy.

Promote competition between foreign, private and state-owned firms

China's past as well as its international experience show that increased domestic competition can raise productivity and efficiency as well as promote innovation. China's accession to the WTO in 2001 triggered economy-wide improvements in efficiency and spurred technology acquisition and adaptation. However, present regulations limit the ability of foreign and private firms to invest and fully compete in a number of key industrial sectors in China. We believe that if China levels the playing field for foreign, private and state-owned companies, it can further increase economic efficiency, promote innovation and transition to a new growth pattern. China could review and modernize its industrial policies to promote healthy competition by lowering the entry barriers of state-dominated industries. In addition, it could dismantle monopolies and oligopolies when competition would deliver superior performance, and introduce oversight arrangements where monopolies are considered necessary to ensure that market power is not abused.

In this respect, the recent economic reforms announced by the Third Plenum of the Central Committee are an important step in the right direction, as they introduce a greater role for private enterprise and markets in the functioning of China's economy.

Encourage and strengthen independent innovation capabilities

China has made great strides in investing in R&D. Over the past 20 years, investment in R&D has tripled in percentage terms, rising from 0.65 percent of GDP in 1993 to 1.97 percent in 2012. The plan is to reach 2.5 percent by 2020. In absolute terms, the numbers are even more impressive. Over the last decade, the volume of R&D investment expanded 6.7 times, reaching RMB1,024 billion in 2012. China now ranks second worldwide in overall R&D spending (after the US).

However, most R&D in China centers on incrementally improving existing products and services. In addition, the highest value-added work in China still is done largely in foreign-invested companies and increasingly in firms led by expatriates who have been educated and have worked abroad. China's independent innovation credentials still fall far behind international levels.

To catch up, the Chinese government needs to create a favorable environment for innovation, including a competitive and open system for R&D funding and effective intellectual property protection. More important, the nation must gain a dominant position in enterprise innovation, choose its own innovative models legitimately, broaden investment and financing channels for independent innovation, and strengthen the application of study and research.
Chinese Firms: From Production-Led to Market-Driven
What does this mean for organizations? To answer that question, we need to shift from the macro-level approach of looking at the factors of production—labor, capital, and productivity—to the micro-level approach, by examining what’s happening inside and between companies to drive productivity growth.

As noted before, productivity is the ratio of output to inputs in production. To improve productivity, a country can work on the numerator side of the ratio (output), the denominator (inputs), or both.

In the past, China’s economy and most Chinese firms focused on the inputs side (the denominator); for example, optimizing production through supply chain management or resource allocation to enhance input efficiency. The time has come to also think about how to increase output in forms such as sales revenue. The story will then be about increasing output by responding to the market, accessing more consumers, and meeting consumers’ needs through multiple channels.

Today’s new competitive arena is forcing Chinese business leaders to think further about market demand. To capture more of the value chain and occupy a more competitive position on the world economic stage, Chinese enterprises need to shift their focus from supply to demand, and from a production-driven to a market-oriented mindset. That means switching emphasis from assembling to creating, and from engineering to inventing. Only then can Chinese businesses compete with foreign firms in the domestic market and win consumers as they move into international markets. After all, one of China’s major objectives is to boost domestic consumption and rely less on export production.

Drawing on our research on firm productivity, we have identified several actions that Chinese firms can take to fully realize the benefit of productivity growth and to close the productivity gap with other economies.
Deepening corporatization and corporate governance reform

Ownership reform

China now has a mixed private and state-owned economic structure. But SOEs are still the dominant forms of enterprises in China. Since economic reform began in 1978, China gradually privatized some state-owned enterprises. Reform was successful for market-oriented SOEs that were granted higher levels of freedom in their operations as well as hard financial budget constraints.

However, SOEs lag behind private firms in terms of profitability and productivity. Decentralization (as opposed to outright privatization) may be more suitable in some cases for improving SOEs’ profitability and productivity, especially when social stability is a concern.

Corporate governance

Having developed against the backdrop of China’s unique culture, Chinese business management differs from Western corporate governance. For example, Confucianism places great emphasis on relationships between people and the need for a proper social hierarchy. The practical effect of this is the existence of extensive bureaucracies, which still stand in China today.

China’s commitment to improving corporate governance has increased since it became part of the WTO. Pressure to do so is coming not only from international forces, which increased oversight responsibilities for companies listing on the New York Stock Exchange, but also from Chinese stockholders themselves.

To strengthen corporate governance, state-owned and private enterprises in China must build boards characterized by a balance of power and openness among all shareholders, top management, and party committees. The corporate agenda should revolve around meeting market demands and driving profit, rather than around relational, cronyistic obligations. Here is where independent directors could come in handy—that is, if companies could value the unbiased judgment and thought leadership that they can bring. As independent directors rise in importance, their compensation packages should reflect their contributions to the company.

Enhancing operational efficiency with technology

In a world characterized by rapid, unpredictable change, the ability to adapt is more important than ever. Firms must become learning organizations that can adapt to their shifting business environment.

To achieve this agility, Chinese firms must invest in building digital capital. They also need to embrace more data-driven processes so they can respond quickly and effectively to fast-changing conditions in the marketplace and the economy at large.

Analytics tools and talent

To ensure high-quality decision-making and respond quickly to country-specific market changes, Chinese companies need to rely more on data-driven insights. To achieve this goal, firms must integrate their core and non-core processes, along with their supporting information technology systems.

But no information technology system can succeed without excellent business insights. Analytics is becoming the new science of business, bringing great strategic potential to companies that can extract business insights from the increasingly large volumes of data they are gathering. That is why analytics talent will increasingly be needed across all industries. Analytics talent are those people who know how to use statistics, quantitative methods, and information-modeling techniques to shape and make business decisions.

Though China is producing many more college graduates with analytics-related degrees than other countries, it may still run out of these skills if demand for analytics accelerates. In addition, Chinese graduates may have the requisite technical skills, but that doesn’t necessarily mean that they are employer-ready. To make effective use of analytics skills and knowledge, employees also need a keen sense of business and the ability to ask the right questions.

Flexible and efficient work models

Our research shows that technology enhances a firm’s productivity through various means. For instance, new technologies such as mobile networks and telecommunication systems can improve employee productivity and workforce flexibility. Telecommuting is an apt example. According to a Reuters poll, approximately one in five workers worldwide, particularly in the Middle East, Latin America, and Asia, telecommute frequently, and nearly 10 percent work from home every day. A telecommuting experiment conducted with a large Chinese travel agency by professors at Stanford and Beijing University found that employees randomly assigned to work at home for nine months increased their output by 13.5 percent over that of the office-based control group. The study also found that home workers reported significantly higher job-satisfaction scores, and their defection rates fell by almost 50 percent. Many national governments have adopted this approach to improve work productivity as well as work-life balance. For instance, the Telework Enhancement Act of 2012 provided a framework for US agencies to offer teleworking as a viable option to employees.

Chinese employers can benefit by letting go of expectations that employees should work the same fixed hours in the same location, under the watchful eye of management. Instead, companies can rethink how to use technology to make work more efficient and to free up people’s time. New technology-enabled businesses are springing up everywhere, and they boast lower costs and greater flexibility than incumbent organizations.

Internationalizing from a stronger position

For Chinese businesses, internationalization doesn’t just mean stepping up exports. It has also come to mean acquiring foreign entities and expanding their brand presence into international markets. However, Chinese companies are still new to cross-border expansion. Their management style, business practices, and the consumer preferences they’re familiar with differ greatly from those in other markets. To internationalize from a stronger position, they’ll need to understand and navigate those differences.

Establishing global leadership in a globalized marketplace

Effective global leadership is important for succeeding in a globalized marketplace. In particular, business leaders need to advance a compelling vision, make the right business decisions for their organization, motivate workers and ensure sustainable growth for the long term. In addition, Accenture’s research on global leadership teams shows that as companies compete in ever more diverse markets, they need to target new and more varied consumers and strategize against new competitors. To do so, they need new qualities of leadership: clarity of focus, agility, a “foot in the future,” and a
commitment to fact-based insight, not just intuition.56 Equally important, they must develop future leaders capable of navigating the global business environment.

Managing global talent

As Chinese firms expand their business to international markets, Chinese entrepreneurs need to rethink their approaches to talent management in a global economy, including how best to win the war for needed skills. This presents daunting social, economic, and cultural challenges for Chinese firms. China doesn’t have enough talent with international experience, and many Chinese companies send their own employees to manage overseas operations. This makes managing any acquired foreign entity difficult. They will need to demonstrate greater respect for diversity, deepen their understanding of Western workplace philosophy and style, and develop a consistent talent management framework across different locations.

An engaged workforce is also critical to business success in a competitive global environment. However, fostering engagement is not easy for any employer. Members of the new generation of workers want autonomy and a chance to participate in decision-making. If they don’t get these, they jump ship. So keeping them engaged is an imperative.

Leadership style can make all the difference. The traditional Chinese approach to leadership, which relies on formal hierarchy and power, will no longer work. Chinese firms need to embrace a more tolerant, democratic, and collaborative organizational culture. Leaders must inspire more than command; the must trust and empower their people, and value their creativity and output more than the hours they’ve spent at work. Instead of telling staff “Do it this way,” they need to say: “Here are our goals. Achieve them in the way you think works best.”

In addition to a new leadership style, meaningful work and career opportunities—along with support for employees’ efforts—are crucial for keeping employees fully engaged at work. To translate individual engagement to collective engagement, leaders must also cultivate a culture of trust and respect.56

Building global brands

Whether Chinese firms use acquired brands or their own brands, they face a challenge in building global brands. In many cases, they will need to adapt the branding practices they use in China’s local markets to appeal to consumers in foreign markets.

They first need to strengthen their understanding of external markets, understand consumer behaviors and respond to changing consumer trends. However, many Chinese firms lack a market-driven mindset and have weak branding and marketing capabilities. One reason for this shortfall is that they never needed to in the past. Most top companies have not been operating in a competitive context in which branding was important. Many of China’s sectors have also been blessed with high growth in the past so that success was a matter of delivering on manufacturing and distribution, not marketing.

Understanding how consumers think and act is key to business success. Chinese firms can make better use of data and predictive analytics tools to gain valuable new insights into consumers’ shifting needs, priorities, and preferences. These insights can position them to exploit opportunities to maximize market share, revenues, or profits.

Building innovation networks within as well as outside Chinese companies’ organizational walls can also help. As consumers grow ever more demanding and diverse, companies can generate ideas by fostering collaboration among employees from different business functions and from those working in partnering firms. Such diversity of ideas boosts the chances that ideas chosen for implementation will have the best potential for commercial success.

Finally, Chinese firms can benefit by incorporating lessons from global best practices. By doing so, they can improve their skills in planning, structuring, and organizing their innovation activities. And they can adapt their innovation techniques as market demand changes.

Investing in innovation

As we’ve seen, research and development can help drive productivity growth for firms in the long run. Recently, Chinese companies have been making impressive progress in R&D. The R&D spending of China’s large and middle-sized industrial enterprises has expanded more than 8.3 times from 2003 to 2011, reaching RMB599 billion in 2011.57 Both SOEs and private companies have made tremendous investments in R&D. In 2012, the largest R&D spender in China was Huawei Technologies, a Chinese multinational networking and telecommunications equipment and services company headquartered in Shenzhen, Guangdong. As a private company, Huawei invested RMB30.1 billion on R&D, accounting for about 13.7 percent of its total revenue.58

Still, typical annual spending for R&D in most Chinese companies is less than 1 percent of a company’s total revenue.59 Such meager investment in R&D stifles firms’ development and prevents them from maintaining their current market share. Tellingly, most innovations resulting from R&D spending are incremental improvements to processes such as manufacturing. To drive productivity growth in the long run, innovation needs to do more than that. And to compete with foreign rivals, Chinese companies must channel their R&D efforts toward moving up the value chain and put greater emphasis on idea generation and business transformation.
Looking Ahead: Deepening Connectivity for the Next Wave of Productivity Growth
As explained in the Introduction to this report, China’s economy is moving toward the network-driven phase in its productivity journey. Chinese enterprises can no longer be isolated entities. The next wave of productivity growth for China’s economy will depend not only on individual firms’ actions, but also increasingly on dense networks of physical and social capital. To extract maximum business value from such networks, Chinese firms need to sharpen their connective abilities.

**Firm-to-firm connectivity**

The biggest success stories in the US business arena today are less about an individual’s or company’s triumphs than the strength of interdependent, regional communities within an industry. The fast development of the high-tech industry in Silicon Valley is a good example, because it demonstrates this spillover effect of firm-to-firm connectivity. Though most studies on industrial clustering focuses on developed countries, such clustering also exists in developing countries, especially in Asia and South America.60

Clustering enhances firms’ productivity by enabling them to gain access to pools of specialized suppliers, skilled workers, services, and information—all of which are critical in a competitive environment. Moreover, cooperation between research institutions and enterprises can greatly facilitate knowledge creation and experimentation. Such connectivity facilitates opportunities to develop new products, improve business processes, and meet customers’ changing needs.

Close proximity and intense competition between firms in a cluster also reduce the temptation to act dishonestly. As a result, firms within a cluster feel more comfortable extending one another trade credit. However, China’s clusters tend to be in industries that are highly labor intensive, low tech and export oriented, such as textiles, clothing, pen manufacturing, and home appliances, and they lack innovation. More advanced industrial clusters are a fairly recent phenomenon in China. Examples include the growth of biotechnology clusters in Beijing, Shanghai and Shenzhen/Guangdong.

The Chinese government has supported the development of clusters by investing in the infrastructure that enables a city to attract businesses. This has been especially true for the emergence of new high-tech industries such as biotechnology in China.

To take advantage of clustering, Chinese firms should put more emphasis on collective, indigenous innovation efforts. Evidence suggests that such efforts at the industry level can extend the technology frontier and drive the technological upgrading of companies in China.

To help Chinese firms learn from each other and from foreign partners, Chinese local governments can establish open industry policies. Knowledge spillover from foreign to local businesses takes place through knowledge transfer within the supply chain, turnover of skilled workers, learning through imitation, and the pressure of competition, which can inspire Chinese companies to improve their production technology and management skills.

In the future, Chinese local firms can strengthen their inter-firm connectivity by using the internet to step up their cross-organizational collaboration.

**Firm-to-consumers and firm-to-suppliers connectivity**

Thanks to a raft of new technologies such as cloud computing, social media, superfast broadband, wireless, and remote mobility, the borders between firms and their stakeholders—customers, suppliers, workers, innovators—have become permeable and reconfigurable. New market mechanisms and intermediaries are arising as customers discover novel ways to cluster together for the purposes of production, consumption, or innovation. In short, the notion of the firm is evolving from that of an organization with relatively well-defined and insulated borders toward that of an interconnected entity with porous external boundaries.

To take advantage of this trend, Chinese firms can forge bonds with a variety of external stakeholders. But to do so, they will need to choose the best strategy based on characteristics such as their relative size, the nature of their industry and their degree of comfort with ceding control. Benefits of such connectivity can take several forms, including lower costs, more insightful understanding of market demand, and improved pricing power and profitability. For example, Audi involves its customers in the design process of next-generation models using collaborative tools. Companies can also gain bargaining power in input markets as well as informational advantages in sourcing factors of production such as innovation and capital.61

**Machine-to-machine connectivity**

A new era of innovation is dawning, with the rise of technologies including cloud computing, analytics, low-cost sensors and Internet connectivity. With the advent of these technologies, the interrelationships between machines, networks, and people have grown more complex and dynamic. Machines are becoming networked and are generating masses of data that companies can use in real time to improve just about every aspect of how they do business. Employees are connected any time at work as well as on the move, working more intelligently and delivering higher service quality.62

The vision behind the “Internet of Things” or “Industrial Internet” is that as machines become ever more intelligent and connected, organizations can use them to reach new heights in their productive potential. For example, companies can detect and prevent or address supply chain problems swiftly, thus realizing cost savings. Hospitals can track their equipment and patient needs so that the right specialists can deliver the right care at the right time more efficiently. Over the last hundred years, “hard” infrastructure—roads, bridges, ports—has constituted the hidden wiring of the global economy that we take for granted. In the same way, networked machines will make up the wiring of the new world.

Technology will help drive Chinese firms’ productivity growth in the future. China is investing heavily in infrastructure, and early and rapid adoption of Industrial Internet technologies could act as a powerful multiplier. In particular, if China can leapfrog other advanced economies in the use of technology, it may be able to avoid going through the same phases of development as the advanced economies traveled. As a result, China could more speedily close the productivity gap with advanced nations. Resource and financial constraints could also be eased, making robust growth more sustainable.
### Table 1 – China’s productivity growth journey

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Macro Characteristics</strong></td>
<td>Rapid expansion of employable labor force due to:</td>
<td>• Huge expansion in exports</td>
<td>• Higher share of services in GDP, aiming at 47 percent by 2015</td>
</tr>
<tr>
<td></td>
<td>• Migration from primary sector to secondary sector</td>
<td>• Capital deepening</td>
<td>• Steady GDP growth, average of 6.9 percent over the next decade</td>
</tr>
<tr>
<td></td>
<td>• Improvement of education and literacy level</td>
<td>• Increasing investment as percent of GDP following the high saving ratio</td>
<td>• Regional integration/connection</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• ↑ Income growth and living standards</td>
<td>• Higher share of R&amp;D in GDP, 2.2 percent by 2015</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Shift to value creation</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Competitiveness falls due to:</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>– ↑ commodity costs</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>– wage growth of real wages exceeds real GDP growth</td>
<td></td>
</tr>
<tr>
<td><strong>Key Business Logic</strong></td>
<td>• Domestic firms focused on low-cost, labor-intensive production</td>
<td>• Efficient mass production</td>
<td>• Product/service innovation</td>
</tr>
<tr>
<td></td>
<td>• Foreign firms engaged in labor arbitrage</td>
<td>– Mass engineered products</td>
<td>• Business process innovation</td>
</tr>
<tr>
<td></td>
<td></td>
<td>– Quality Attainment</td>
<td>• Human capital strategy</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Still more growth in foreign demand</td>
<td>• Customer intimacy via analytics</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Networks and collaborations</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Localization &amp; specialization via clusters (spillover and demonstration effects)</td>
</tr>
<tr>
<td><strong>Policy, Regulation and Technology Progress</strong></td>
<td>• 9 yrs. free and compulsory education since 1986</td>
<td>• Joined WTO in 2001</td>
<td>• Improvement in physical connections via high-speed railways and airports</td>
</tr>
<tr>
<td></td>
<td>• Educated urban youth working in the countryside returned to the cities</td>
<td>• Use of capital controls</td>
<td>• Virtual connection via cloud and mobility</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Export-led growth strategy</td>
<td>• National innovation system</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Internet/ERP/Software</td>
<td>• To double the 2010 average income per capita by 2020</td>
</tr>
<tr>
<td><strong>Products + Services</strong></td>
<td>Accelerated growth of labor intensive industries: e.g. textile, leather manufacturing and apparel.</td>
<td>Growth in capital intensive manufacturing industries e.g. electronic equipment, machinery and transportation manufacturing</td>
<td>Technology + Services</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• The value added of financial sector grows at an average of 26% in 2004–2010, exceeding overall tertiary sectors’ growth</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Mass services</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Remote health care</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Mobile Banking. In 2010–2012, the transaction value by mobile banking increased by 13.5 times.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Online education</td>
</tr>
</tbody>
</table>

Source: Accenture analysis
Table 2 – Elasticity of four drivers of firm-level productivity

<table>
<thead>
<tr>
<th>Industry name</th>
<th>Elasticity of use of technology</th>
<th>Elasticity of R&amp;D</th>
<th>Elasticity of export</th>
<th>Elasticity of scale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agricultural and By-Product Processing</td>
<td>1.97***</td>
<td>1.11***</td>
<td>-0.51***</td>
<td>8.84***</td>
</tr>
<tr>
<td>Food Manufacturing</td>
<td>2.46***</td>
<td>1.64***</td>
<td>2.29***</td>
<td>12.92***</td>
</tr>
<tr>
<td>Beverage Manufacturing</td>
<td>0.51</td>
<td>2.30***</td>
<td>5.47***</td>
<td>24.08***</td>
</tr>
<tr>
<td>Tobacco Products</td>
<td>15.67</td>
<td>4.59</td>
<td>8.08***</td>
<td>-3.94*</td>
</tr>
<tr>
<td>Textile</td>
<td>-0.22</td>
<td>1.94***</td>
<td>1.57***</td>
<td>8.94***</td>
</tr>
<tr>
<td>Apparel, Shoes, and Hat Manufacturing</td>
<td>0.03</td>
<td>1.64***</td>
<td>0.19***</td>
<td>7.69***</td>
</tr>
<tr>
<td>Leather, Fur, and Coat Products Manufacturing</td>
<td>-0.22</td>
<td>0.65***</td>
<td>0.47***</td>
<td>4.45***</td>
</tr>
<tr>
<td>Wood Processing, and Other Wood Products</td>
<td>1.33***</td>
<td>1.33***</td>
<td>0.74***</td>
<td>11.41***</td>
</tr>
<tr>
<td>Furniture Manufacturing Industry</td>
<td>-0.17</td>
<td>1.81***</td>
<td>0.01</td>
<td>7.42***</td>
</tr>
<tr>
<td>Paper Making &amp; Paper Products Industry</td>
<td>1.20***</td>
<td>2.34***</td>
<td>1.91***</td>
<td>12.01***</td>
</tr>
<tr>
<td>Printing and Recording Media Reproducing</td>
<td>4.50***</td>
<td>3.25***</td>
<td>0.74***</td>
<td>12.13***</td>
</tr>
<tr>
<td>Stationery and Sporting Goods</td>
<td>0.98*</td>
<td>1.01***</td>
<td>0.37***</td>
<td>5.71***</td>
</tr>
<tr>
<td>Petroleum Processing and Coking Plant Industry</td>
<td>2.77**</td>
<td>2.52***</td>
<td>-0.79***</td>
<td>14.44***</td>
</tr>
<tr>
<td>Chemical Materials &amp; Products Manufacturing</td>
<td>1.17***</td>
<td>1.55***</td>
<td>2.78***</td>
<td>9.61***</td>
</tr>
<tr>
<td>Pharmaceutical</td>
<td>-0.33</td>
<td>-0.27</td>
<td>5.17***</td>
<td>10.43***</td>
</tr>
<tr>
<td>Chemical Fiber Manufacturing</td>
<td>0.94</td>
<td>2.52***</td>
<td>2.62***</td>
<td>14.23***</td>
</tr>
<tr>
<td>Balata (Rubber) Product Industry</td>
<td>0.28</td>
<td>0.41</td>
<td>1.09***</td>
<td>9.63***</td>
</tr>
<tr>
<td>Plastic Product Industry</td>
<td>0.28</td>
<td>1.71***</td>
<td>0.65***</td>
<td>7.96***</td>
</tr>
<tr>
<td>Nonmetallic Minerals Products</td>
<td>3.31***</td>
<td>1.44***</td>
<td>1.57***</td>
<td>12.84***</td>
</tr>
<tr>
<td>Ferrous Metal Smelting and Rolling Processing</td>
<td>1.41**</td>
<td>2.37***</td>
<td>1.17***</td>
<td>13.47***</td>
</tr>
<tr>
<td>Non-Ferrous Metal Rolling Processing Industry</td>
<td>1.30</td>
<td>1.37***</td>
<td>1.82***</td>
<td>10.53***</td>
</tr>
<tr>
<td>Metal Product</td>
<td>0.61*</td>
<td>1.17***</td>
<td>0.48***</td>
<td>10.87***</td>
</tr>
<tr>
<td>General Machinery Manufacturing</td>
<td>-0.93**</td>
<td>1.42***</td>
<td>1.99***</td>
<td>8.91***</td>
</tr>
<tr>
<td>Special Machinery Manufacturing</td>
<td>1.07*</td>
<td>1.97***</td>
<td>1.53***</td>
<td>11.88***</td>
</tr>
<tr>
<td>Transportation Equipment Manufacturing</td>
<td>2.42***</td>
<td>2.39***</td>
<td>1.51***</td>
<td>10.78***</td>
</tr>
<tr>
<td>Electronic Machinery and Equipment</td>
<td>1.19***</td>
<td>1.78***</td>
<td>1.29***</td>
<td>10.85***</td>
</tr>
<tr>
<td>Electronic Communication Equipment and Computer Manufacturing</td>
<td>1.45</td>
<td>2.41***</td>
<td>0.97***</td>
<td>9.36**</td>
</tr>
<tr>
<td>Instrument, Meter, Stationery and Office Machine Manufacturing</td>
<td>4.42***</td>
<td>1.34***</td>
<td>1.01***</td>
<td>11.97***</td>
</tr>
<tr>
<td>Handicraft Article</td>
<td>-0.51</td>
<td>1.55***</td>
<td>0.49***</td>
<td>16.26***</td>
</tr>
</tbody>
</table>

N=1,000

<table>
<thead>
<tr>
<th>Significance level</th>
<th>Critical value</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>1%</td>
<td>2.581</td>
<td>***</td>
</tr>
<tr>
<td>5%</td>
<td>1.962</td>
<td>**</td>
</tr>
<tr>
<td>10%</td>
<td>1.646</td>
<td>*</td>
</tr>
</tbody>
</table>

Note: *** denotes that the coefficient is statistically significant at the 1 percent level.
Table 3 – Elasticity of varied types of ownership on productivity

<table>
<thead>
<tr>
<th>Industry name</th>
<th>Private</th>
<th>Collective</th>
<th>HMT</th>
<th>Foreign</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agricultural and By-Product Processing</td>
<td>2.56***</td>
<td>2.63***</td>
<td>2.68***</td>
<td>2.56***</td>
</tr>
<tr>
<td>Food Manufacturing</td>
<td>4.23***</td>
<td>3.49***</td>
<td>4.30***</td>
<td>3.64***</td>
</tr>
<tr>
<td>Beverage Manufacturing</td>
<td>5.06***</td>
<td>2.82***</td>
<td>8.18***</td>
<td>10.45***</td>
</tr>
<tr>
<td>Tobacco Products</td>
<td>11.69**</td>
<td>20.89***</td>
<td>-4.39</td>
<td>0.00</td>
</tr>
<tr>
<td>Textile</td>
<td>2.57***</td>
<td>2.03***</td>
<td>2.09***</td>
<td>2.05***</td>
</tr>
<tr>
<td>Apparel, Shoes, and Hat Manufacturing</td>
<td>2.42***</td>
<td>1.31***</td>
<td>1.73***</td>
<td>1.64***</td>
</tr>
<tr>
<td>Leather, Fur, and Coat Products Manufacturing</td>
<td>2.78***</td>
<td>3.30***</td>
<td>1.74**</td>
<td>1.70**</td>
</tr>
<tr>
<td>Wood Processing, and Other Wood Products</td>
<td>3.37***</td>
<td>3.20***</td>
<td>2.62***</td>
<td>3.13***</td>
</tr>
<tr>
<td>Furniture Manufacturing Industry</td>
<td>4.55***</td>
<td>3.49***</td>
<td>1.22</td>
<td>4.52***</td>
</tr>
<tr>
<td>Paper Making &amp; Paper Products Industry</td>
<td>2.49***</td>
<td>2.61***</td>
<td>3.44***</td>
<td>5.72***</td>
</tr>
<tr>
<td>Printing and Recording Media Reproducing</td>
<td>7.89***</td>
<td>5.58***</td>
<td>5.39***</td>
<td>6.59***</td>
</tr>
<tr>
<td>Stationery and Sporting Goods</td>
<td>1.14**</td>
<td>0.64</td>
<td>0.09</td>
<td>0.49</td>
</tr>
<tr>
<td>Petroleum Processing and Coking Plant Industry</td>
<td>-4.98***</td>
<td>-5.95****</td>
<td>-1.13</td>
<td>-0.14</td>
</tr>
<tr>
<td>Chemical Materials &amp; Products Manufacturing</td>
<td>0.65***</td>
<td>-0.17</td>
<td>0.98***</td>
<td>2.87***</td>
</tr>
<tr>
<td>Pharmaceutical</td>
<td>4.48***</td>
<td>2.95***</td>
<td>3.49***</td>
<td>3.69***</td>
</tr>
<tr>
<td>Chemical Fiber Manufacturing</td>
<td>-2.23***</td>
<td>-2.68***</td>
<td>-2.49**</td>
<td>-0.54</td>
</tr>
<tr>
<td>Balata (Rubber) Product Industry</td>
<td>2.21***</td>
<td>1.24**</td>
<td>0.61</td>
<td>1.26**</td>
</tr>
<tr>
<td>Plastic Product Industry</td>
<td>1.14***</td>
<td>0.69**</td>
<td>0.50</td>
<td>1.04***</td>
</tr>
<tr>
<td>Nonmetallic Minerals Products</td>
<td>2.14***</td>
<td>0.96***</td>
<td>2.45***</td>
<td>2.99***</td>
</tr>
<tr>
<td>Ferrous Metal Smelting and Rolling Processing</td>
<td>0.92***</td>
<td>-1.74***</td>
<td>2.96***</td>
<td>2.95***</td>
</tr>
<tr>
<td>Non–Ferrous Metal Rolling Processing Industry</td>
<td>0.05</td>
<td>0.15</td>
<td>0.27</td>
<td>0.94</td>
</tr>
<tr>
<td>Metal Product</td>
<td>1.10***</td>
<td>-0.23</td>
<td>0.19</td>
<td>1.42***</td>
</tr>
<tr>
<td>General Machinery Manufacturing</td>
<td>3.53***</td>
<td>2.35***</td>
<td>3.22***</td>
<td>5.24***</td>
</tr>
<tr>
<td>Special Machinery Manufacturing</td>
<td>4.06***</td>
<td>3.18***</td>
<td>2.04***</td>
<td>4.06***</td>
</tr>
<tr>
<td>Transportation Equipment Manufacturing</td>
<td>2.71***</td>
<td>1.40***</td>
<td>1.58***</td>
<td>4.35***</td>
</tr>
<tr>
<td>Electronic Machinery and Equipment</td>
<td>1.40***</td>
<td>1.64***</td>
<td>0.18</td>
<td>1.81***</td>
</tr>
<tr>
<td>Electronic Communication Equipment and Computer Manufacturing</td>
<td>2.21***</td>
<td>2.91***</td>
<td>0.98***</td>
<td>2.77***</td>
</tr>
<tr>
<td>Instrument, Meter, Stationery and Office Machine Manufacturing</td>
<td>4.52***</td>
<td>3.85***</td>
<td>2.90***</td>
<td>5.98***</td>
</tr>
<tr>
<td>Handicraft Article</td>
<td>2.41***</td>
<td>1.36**</td>
<td>0.57</td>
<td>1.08</td>
</tr>
</tbody>
</table>

N=1,000

<table>
<thead>
<tr>
<th>Significance level</th>
<th>Critical value</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>1%</td>
<td>2.581</td>
<td>***</td>
</tr>
<tr>
<td>5%</td>
<td>1.962</td>
<td>**</td>
</tr>
<tr>
<td>10%</td>
<td>1.646</td>
<td>*</td>
</tr>
</tbody>
</table>

Note: *** denotes that the coefficient is statistically significant at the 1 percent level.
### Table 4 - Clustering effect on firm-level productivity

<table>
<thead>
<tr>
<th>Industry name</th>
<th>Shenzhen</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agricultural and By-Product Processing</td>
<td>1.02</td>
</tr>
<tr>
<td>Food Manufacturing</td>
<td>0.79</td>
</tr>
<tr>
<td>Beverage Manufacturing</td>
<td>9.79***</td>
</tr>
<tr>
<td>Tobacco Products</td>
<td>27.57***</td>
</tr>
<tr>
<td>Textile</td>
<td>0.81**</td>
</tr>
<tr>
<td>Apparel, Shoes, and Hat Manufacturing</td>
<td>-2.10***</td>
</tr>
<tr>
<td>Leather, Fur, and Coat Products Manufacturing</td>
<td>-2.26***</td>
</tr>
<tr>
<td>Wood Processing, and Other Wood Products</td>
<td>-0.25</td>
</tr>
<tr>
<td>Furniture Manufacturing Industry</td>
<td>-2.44***</td>
</tr>
<tr>
<td>Paper Making &amp; Paper Products Industry</td>
<td>1.17***</td>
</tr>
<tr>
<td>Printing and Recording Media Reproducing</td>
<td>1.11***</td>
</tr>
<tr>
<td>Stationery and Sporting Goods</td>
<td>-0.97***</td>
</tr>
<tr>
<td>Petroleum Processing and Coking Plant Industry</td>
<td>2.98</td>
</tr>
<tr>
<td>Chemical Materials &amp; Products Manufacturing</td>
<td>0.71**</td>
</tr>
<tr>
<td>Pharmaceutical</td>
<td>-0.99</td>
</tr>
<tr>
<td>Chemical Fiber Manufacturing</td>
<td>-3.23**</td>
</tr>
<tr>
<td>Balata (Rubber) Product Industry</td>
<td>0.74</td>
</tr>
<tr>
<td>Plastic Product Industry</td>
<td>-0.63***</td>
</tr>
<tr>
<td>Nonmetallic Minerals Products</td>
<td>2.41***</td>
</tr>
<tr>
<td>Ferrous Metal Smelting and Rolling Processing</td>
<td>4.55***</td>
</tr>
<tr>
<td>Non-Ferrous Metal Rolling Processing Industry</td>
<td>-0.95</td>
</tr>
<tr>
<td>Metal Product</td>
<td>-0.79***</td>
</tr>
<tr>
<td>General Machinery Manufacturing</td>
<td>1.21***</td>
</tr>
<tr>
<td>Special Machinery Manufacturing</td>
<td>0.99**</td>
</tr>
<tr>
<td>Transportation Equipment Manufacturing</td>
<td>1.20**</td>
</tr>
<tr>
<td>Electronic Machinery and Equipment</td>
<td>0.98***</td>
</tr>
<tr>
<td>Electronic Communication Equipment and Computer Manufacturing</td>
<td>0.76***</td>
</tr>
<tr>
<td>Instrument, Meter, Stationery and Office Machine Manufacturing</td>
<td>1.14</td>
</tr>
<tr>
<td>Handicraft Article</td>
<td>1.13***</td>
</tr>
</tbody>
</table>

N=1,000

<table>
<thead>
<tr>
<th>Significance level</th>
<th>Critical value</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>1%</td>
<td>2.581</td>
<td>***</td>
</tr>
<tr>
<td>5%</td>
<td>1.962</td>
<td>**</td>
</tr>
<tr>
<td>10%</td>
<td>1.646</td>
<td>*</td>
</tr>
</tbody>
</table>

Note: We have taken Shenzhen as the sample location for testing the clustering effect on firms inside Shenzhen city. *** denotes that the coefficient is statistically significant at the 1 percent level.
References

1. Oxford Economics. The real GDP was converted at 2005 price.

2. World Bank. Poverty is defined as the number of people living on <US$1.25 per day.

3. Fortune Magazine. In 2013’s list of Fortune Global 500 Companies, there are 95 Chinese companies: 85 in mainland China, 4 in HK, and 6 in Taiwan.


8. The “exchanging markets for technologies” policy centers on continually expanding market openings, attracting more foreign investment and introducing more advanced technologies.


47. Elizabeth Craig, Robert J. Thomas, Charlene Hou, and Smriti Mathur, "Where will all the STEM talent come from?" Accenture Institute for High Performance, May 2012; and Elizabeth Craig, Robert J. Thomas, Charlene Hou, and Smriti Mathur, "Crunch Time: How to overcome the looming global analytics talent mismatch," Accenture Institute for High Performance, May 2013.


Methodology

The Accenture Institute for High Performance collaborated with several research partners in the data collection and analysis for this research report. For our macro-level analysis, Oxford Economics constructed the framework for breaking down China’s GDP growth to assess and forecast the contribution of three factors (labor, capital, and TFP). For our sectoral-level analysis, Lombard Street Research, using their own proprietary models, estimated the TFP performance against other performance metrics (such as ROA and profit margins) of 19 sectors in China. For our firm-level analysis, Professor Heng Yin supplied his personal methodology to quantify TFP at the firm level and to identify the possible levers that contribute to varying outcomes.

TFP at the macro-level

Data collection: The raw data for labor supply, capital stock and GDP of China were collected from the United Nations, CEIC Data and China’s National Statistical Yearbook.

Growth accounting framework: Starting from the Cobb-Douglas production function with constant returns to scale, the growth rate of GDP can be decomposed into three factors: labor, capital, and TFP. The long-run growth in GDP is defined as:

\[ \ln(GDP) = \alpha \ln(LS) + (1 - \alpha) \ln(K) + TFP \]

where \( \ln \) is the natural logarithm, \( LS \) is the labor supply, \( K \) is the capital stock (calculated as the previous year’s capital stock plus investment minus depreciation), and \( TFP \) is total factor productivity. \( \alpha \) is the share of labor in output and \( (1 - \alpha) \) the share of capital. We determined the \( \alpha \) specific to China from input-output tables.

Interpretation: TFP captures all influences on growth other than increases in the capital stock and labour supply. Given this, it covers improvements in human capital and skills, the institutional environment, how efficient the allocation of capital is, technological progress, etc. TFP is calculated as:

\[ TFP = \ln(GDP) - \alpha \ln(LS) - (1 - \alpha) \ln(K). \]

TFP at the sectoral level

Data collection: We lifted data on 19 different industries, covering both the manufacturing and services sectors, from Datastream. The dataset only includes A-share listed companies (those traded on the Shanghai Stock Exchange).

TFP calculation: We estimated the contribution of the tangible inputs to production by calculating the shares of income accruing to capital and labor in a given period and multiplying those through by the change in capital stock and employees, respectively.

The labor share is the share of income that accrues to labor. In our dataset, the income accruing to labor was taken as salaries and benefits. The labor share was the ratio of salaries and benefits to this the sum of EBITDA (Earnings Before Interest, Taxes, Depreciation and Amortization). Likewise the capital share is that accruing to capital. To get around measurement errors, and so that the result would be conceptually sound, we calculate capital share as one minus the labor share.

To estimate changes in the capital stock, we used the Property, plant and equipment as a starting point, as it was most consistent with the macro picture. The deflator we used to convert the capital stock to real terms is the aggregate fixed asset investment inflation, published by the National Bureau of Statistics. This may have the effect of overestimating the growth of capital stock in sectors with the greatest overinvestment and underestimating the effect of TFP in those sectors.

We used gross value added (GVA) to quantify output by industry, and we standardized those numbers using the sector-specific deflators for output provided from Datastream.

TFP at the firm level

Data collection: The data for this analysis came from the Chinese Industrial Enterprises Database, compiled by the National Bureau of Statistics. This database covers all non-state, industrial firms with more than RMB5 million in revenue (about US$600,000) and all state-owned, industrial firms, for a total of 3.07 million companies in 29 industry categories. The year range of this dataset was from 1998 to 2009.

TFP estimation: We sorted the data into 29 industries and applied an economic model developed by Dr. Heng Yin to estimate TFP performance for each firm. For more detailed information about this method, please refer to "Estimate and Analyze Firms’ TFP Performance under Circumstances of Imperfect Competition and Quality Discrepancy of Products", Heng Yin, Beijing Normal University, 2013.
Acknowledgments

Core research team
Jing Yu, Mickey Fang Xu, Charlene Tsang, Serena Jing Qiu, Mark Purdy

Managing Director Sponsor
Gong Li

We would also like to thank the following individuals for their advice on the study (name in alphabetic order):

Freya Beamish, Rachel Davis, Lance Ealey, Yuelong Fan, Irene Han, Gwen Harrigan, Laurie Johnson, Melissa Kidd, David Light, Rain Newton Smith, Carron Sass, Denis Sheng

Qingxin Lan
Professor, University of International Business and Economics, Beijing

Ruo’en Ren
Professor, School of Economics and Management, Beihang University

Jian Su
Professor, Deputy Dean of the Department of Economics, Peking University

Heng Yin
Professor, Dean of the School of Economics and Business Administration, Beijing Normal University
For more information about Accenture’s China Productivity research, visit www.accenture.com/cn-zh/research or contact mark.purdy@accenture.com.

About the Accenture Institute for High Performance

The Accenture Institute for High Performance creates strategic insights into key management issues and macroeconomic and political trends through original research and analysis. Its management researchers combine world-class reputations with Accenture’s extensive consulting, technology, and outsourcing experience to conduct innovative research and analysis into how organizations become and high-performance businesses.

About Accenture

Accenture is a global management consulting, technology services, and outsourcing company, with approximately 275,000 people serving clients in more than 120 countries. Combining unparalleled experience, comprehensive capabilities across all industries and business functions, and extensive research on the world’s most successful companies, Accenture collaborates with clients to help them become high-performance businesses and governments. The company generated net revenues of US$28.6 billion for the fiscal year ended Aug. 31, 2013. Its home page is www.accenture.com.