6: Growth and Structural Change

Economic growth, in the simplest meaning of the term, is an increase in the total amount of goods and services available. This is measured by the growth of gross domestic product (GDP), which is the total of all the value added in an economy. Dividing by population gives the amount of goods and services available per individual, that is, GDP per capita. The development process is a gradual, but steady and sustained increase in output per capita. Output increases because society accumulates physical capital to equip workers to become more productive, and because households boost the productivity of their family members by investing more into human capital, especially health and education. Technology becomes more sophisticated as better-educated, better-equipped workers become more adept at their work. This chapter begins with a brief characterization of China's long-run growth experience, followed by a short discussion of the data on which it is based.

Growth is not just expansion in the quantity of output; many structural changes occur in regular patterns as the economy is reshaped by the actions of many individuals. The second part of this chapter emphasizes the common processes that drive structural change and growth in all developing economies. Chapter 5 set the stage for this discussion, because urbanization is a core driver of structural change. However, we here broaden the discussion to structural change in GDP, in which China shares common features with most other developing countries. There are still distinctive Chinese features, but they are not as unique as t hose that shape urbanization. The structural perspective thus provides benchmarks that show how far China has come along a common development path and where it diverges from that common path.

All developing countries go through common structural changes, but only a select few become "growth miracles." In this, China's extremely rapid growth phase resembles earlier East Asian growth super-stars. To approach that story, this chapter first addresses perhaps the most distinctive feature of China's economic structure, its extraordinarily high and sustained rate of investment. While investment has long been high, many analysts expected them to become less extreme after economic reforms at the turn of the century: they did not. Instead, during the period from 2006 to about 2010, China's investment rate increased again and the share of industry increased again, a development pattern generally described as "unbalanced." Government policy explains a great deal of China's high investment rate. The relationship between investment and growth is discussed. High investment explains a great deal of China's rapid growth.

While investment is of particular importance, all factors of production must be considered to explain growth. A general production function approach is introduced which shows that growth is the outcome of the growth of factor inputs into production, and also an unexplained or "residual" component. This framework allows us to perform a "growth

accounting" analysis that helps understand China's growth miracle phase.[1] "Growth miracles" are the result of rapid growth of inputs *plus* productivity improvement: China's experience is no exception to this general rule. The structural change and growth accounting approaches provide a basis for projecting China's future development. In particular, they lead us to anticipate that China's "growth miracle" is now coming to an end. The growth of factor inputs will slow: Labor force growth has slowed to zero, and the potential of rural-to-urban migration to offset the otherwise shrinking urban workforce is also shifting down. The contribution of the productivity-enhancing "residual" is uncertain. It is likely that China's long-run growth rate will ratchet down, but still be robust by international standards.

Because structural change occurs in regular patterns, we can expect that China will repeat many of the changes undergone by earlier developing East Asian economies, especially miracle growth economies. Indeed, the comparative perspective suggests that the *transition* to a slower-growing economy can be difficult. It is not that slower growth in and of itself is bad—quite the contrary, since slower growth partially reflects slower population growth and can be accompanied with continued rapid increases in living standards. However, many forerunner economies have had difficulty making the shift to a lower growth rate, and China may also experience turbulence as it moves to a different growth model. These changes are easy to understand, but hard to predict, because structural changes are associated with many other dramatic social changes: The outlook for these intersecting changes is briefly discussed in the final section.

6.1 Long-run Growth.

China grew fast between 1949 and 1978, but growth really took off after the beginning of reform in 1978. Moreover, the acceleration of economic growth coincided with the slowing of population growth, so per capita growth accelerated even more dramatically. According to official data (2015 revision), shown in Table 6-1, average annual GDP growth accelerated from 6% in the pre-1978 period to almost 10% in the 1978-2000 period. At the same time, population growth decelerated from 1.9% per year before 1978 to only 1.3% after 1978. As a result, per capita GDP growth doubled, jumping from 4.1% to 8.4% annually.

Table 6.1: Growth of per capita GDP (average annual growth rates, percentage).

	GDP	Population	GDP per capita
1952-1978	6.0	1.9	4.1

[1] The growth accounting framework will be used later in the volume, in discussing agriculture (chapter 11), industry (13), technology (15) and macroeconomics (20).

1978-2000	9.7	1.3	8.4
2000-2010	10.5	0.6	9.9
2010-2013	8.3	0.5	7.8
2014	7.4	0.5	6.8

As impressive as the performance was up until 2000, the subsequent decade was even more remarkable. China was an integral part of the global economic boom during the 2003-2007 period, and then managed to sidestep the worst of the global financial crisis in 2008-2009. By 2010, China had already returned to growth rates comparable to those it enjoyed before the crisis. As a result, China's growth rate for the decade after 2000 actually accelerated, compared to the previous twenty-two years. China emerged as the world's second largest economy during 2010, much earlier than had previously been expected. Moreover, since population growth continued to slow, growth of GDP per capita accelerated noticeably, from 8.4% per year before 2001 to 9.9% per year through 2010. The achievement of a decade of *per capita* growth at almost 10% annually is an astonishing achievement that may be unprecedented. Since 2010, unambiguous signs of slowdown have begun to emerge. Overall, from 1978 through 2010, per capita growth proceeded at an annual average rate of 8.8% and per capita GDP was *fifteen times* in 2010 what it was in 1978. China is a certified "growth miracle."

6.1.1 DATA AND THE MEASUREMENT OF GROWTH.

However, the data shown in Table 6.1, and indeed used throughout this text, are official Chinese data. How reliable are these data? First, we have to acknowledge that the official data are more reliable than anything else. That is, there is no plausible alternative set of data for China, and no one has ever demonstrated that the extensive Chinese numbers published are mutually contradictory or inconsistent with externally verifiable facts. So the truth is that we have no choice but to use official data. And after all, the official data are the product of a data collection network systematically analyzed by a large group of conscientious government statisticians. Having said this, there are many reasons to emphasize that the data are neither as precise nor as reliable as we would prefer. GDP data from most developing countries are prone to substantial errors, and China is no exception. Statistical accuracy is a problem in transitional economies because the magnitude of change is so large (both in the composition of output and in relative prices). China is both transitional and a developing country.

Since the mid-1990s, Chinese statisticians have made important changes in the way they collect and analyze data in an attempt to keep up with changes in the economy. Unfortunately, these changes have not always led to better data quality overall. There was an especially difficult period in the late 1990s, as China made a transition to a new data collection system in 1998 that was in some respects a failure. Attempting to adjust data collection procedures to an economy with many more small-scale businesses, the National Statistical Bureau (NSB) shifted

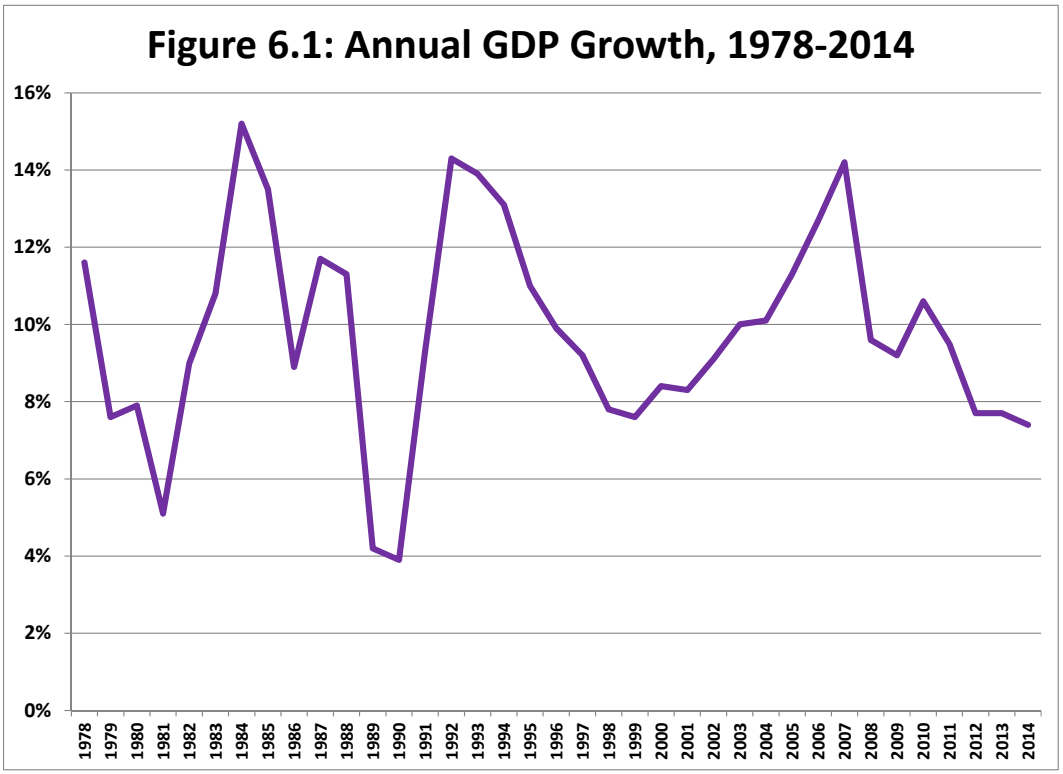
to sample survey estimates of the size of small-scale industry and services. The resulting GDP numbers were not only arguably less reliable than before, they were also difficult to corroborate with consistent past time series. Indeed, during 2005, the NSB revised GDP upward by 16% to reflect a more inclusive count of small-scale service providers primarily in transport, retailing and restaurants. (These new estimates are used through this textbook). Moreover, the 1998 change-over to the new system happened to coincide with a period of exceptionally rapid change in the real economy, and so our picture of the 1998-99 period is especially murky. These problems have affected statistical reporting ever since, particularly in the reporting of industrial value added (See discussion in Holz 2014).

Three sets of problems are serious and must be acknowledged:

1. Official statistics do not adequately correct for the effects of inflation. The GDP deflator, the measure of inflation that is used by official government statisticians to convert nominal (current price) GDP growth to real (constant price) growth, grows more slowly than almost every other measure of inflation. Ren (1995) and Young (2003) present good accounts of the data, and convincing arguments for the use of alternative price indexes. Using different price indexes lowers the overall GDP growth rate by 1.6 percentage points annually for the period Young examines (1978-1998). This problem is most acute for the 1980s, when inflation was rampant. Since 1996 prices have been stable, and this is a less serious problem.

2. Statisticians have a very hard time accounting for the expanding scope of the economy. Twenty-five years ago, China didn't produce color televisions, to say nothing of computers. Chinese statisticians tend to count fast-growing items like computers by valuing them at their early, very high, prices, which over-weights them and therefore over-states growth. But there are also fast-growing items that had very low prices at the beginning of the era, such as health care and housing. Many of these were rationed at the beginning of the period, but are now readily available at market prices. Counting these items at their beginning-of-period prices tends to under-state growth, creating an offsetting bias.

3. Data collection is intertwined with politics in China in a way that reduces the accuracy of statistics. The NSB has a monopoly on statistical collection, so the benefits of a competitive market place haven't reached the data field yet. Many crucial data series—including GDP—are used as success indicators for local officials, who therefore have incentives to inflate or otherwise distort the numbers that are reported. Moreover, the Communist Party monopoly over the press affects the way economic news is reported. For example, when revisions are made to GDP data, they are almost never used to revise growth rates downward, even when that would seem to be logically appropriate. These are serious problems, and they tell us to use caution with Chinese data and accept the data only within a fairly large margin of error. China's national accounts certainly less accurate than developed country accounts.



This does not mean, however, that Chinese economic growth is somehow illusory. Quite the contrary: some few key elements of the economy are fully verifiable: for example, exports have grown much more rapidly than GDP, and are fully corroborated by the independent statistics of importing countries. If China's GDP were actually growing significantly more slowly than official figures indicate, exports would have increased their share of GDP even more dramatically, and it would be difficult to explain how exports had grown so much more rapidly than GDP. China's dramatic export boom only makes sense in the context of a rapidly growing GDP. There are a number of similar cases of readily verified series (fiscal revenues, for example). As noted above, no alternate procedure for assessing China's growth meets basic consistency checks; and finally, rapid growth and transformation corresponds to the common sense evidence of personal experience. Overall, then, there is likely to be some upward bias to the official recorded growth rates, but it will not change the fundamental picture of rapid growth. Allowing for inadequate deflation during the 1980s and early 1990s, and perhaps for an undercount of GDP in 1978, a maximum plausible adjustment of Chinese GDP growth would lower it one to two percentage points per year. If China's actual per capita GDP growth was 1.5 percentage points lower than the official rate every year between 1978 and 2013, the long run annual average growth rate would still be 7.2% over 35 years. This would still be the most sustained period of rapid economic growth in human history.

Growth of per capita GDP above 6% for more than fifteen years is not unprecedented, but worldwide it has only happened in three episodes, all of them in East Asia. These episodes can serve as the definition of "growth miracles." First, Japan led the way with growth of GDP per capita slightly above 8% per year for eighteen years, from 1955 to 1973. After 1973, Japanese growth moderated, but remained healthy until the end of the 1980s. Second, during the fourteen year period from 1982 through 1996, several East Asian economies grew at very high rates. During this period, annual growth of GDP per capita in Korea was 7.4%; in Taiwan 7.1%; and in Thailand 6.8%. However, these economies experienced a fairly dramatic economic shrinkage after 1996, and slower growth thereafter, suggesting that some part of the rapid growth before 1996 might have been unsustainable. The third episode is China since 1978. China's contemporary growth thus represents the third major East Asian growth surge. If we accept the maximum possible correction for statistical overstatement, China's growth is not necessarily more rapid than the other two. However, China's "miracle growth" period is still unique, since it has extended over thirty-five years, far longer than the other two episodes. In addition, China's growth miracle has affected many more people than the two previous episodes,

Box 6.1: Calculating GDP

The basic idea of GDP is simple: It is the total "value-added," the sum of all the market-priced, value-adding activity carried out in a given geographic territory in a certain time period. Calculating GDP involves getting rid of the double-counting that would be involved if we simply added output from different sectors. There are three different ways to calculate GDP, each of which provides a different kind of insight into the economy. In principle, each approach should produce the same number. Each is based on very different types of data, so the calculation methods serve as a check on each other. (In practice, of course, there are differences because there are errors and the different sources cannot precisely match up; but hopefully these are small.)

Production: The production approach builds up GDP by looking at the net value-added in each sector. We avoid double-counting is avoided by excluding the value of purchased steel (for example) from the value of automobiles produced.

Expenditure: The expenditure approach looks at broad categories of expenditure to determine what goods and services are actually used for. Consumption, investment, government consumption, and net exports are the most common way to classify expenditure-side GDP.

Income: The income approach aggregates the net income of different categories of the population. Households, businesses and government all receive income.

This chapter presents analyses based on the production and expenditure side. The income side is discussed elsewhere, especially in Chapter 19, the Financial System.

6.1.3 GROWTH CYCLES.

Figure 6-1 shows that there has been a pronounced cyclical pattern to GDP growth post-1978. There have been four periods of especially rapid growth, close to, or surpassing 10% per year. Peaks are evident in 1984-85, 1992-94, and 2003-7. Each of those peaks came after a period of policy-induced slowdown. Each peak growth period corresponded to a period of accelerated restructuring, triggered by institutional changes, but also to a bounce-back from the policies in place in the earlier period. Thus the 1984-85 growth surge was the result of successful rural reforms, but also to the end of the "readjustment" of the national economy that had cut-back investment in 1981-82. The 1992-94 surge was the result of accelerated opening and liberalization following Deng Xiaoping's "Southern Tour," but also to the end of the period of retrenchment that followed the Tiananmen disorder. The 2003-7 surge was the result of WTO membership and harvesting the results of SOE restructuring, but also to the end of the short-term recession caused by that same SOE restructuring (combined with the impact of the Asian financial crisis of 1998-9). The post-2013 slowdown is quite different from earlier policy-based slowdown. As we will see, it is the result of deep long-term structural factors in the economy.

6.2 Structural Change

All countries begin development predominantly agricultural. In the early stages of development, farmers make up the bulk of the labor force, and most value added is in agriculture. As development proceeds, certain common patterns of structural change are observed that are associated with the growth away from a predominantly agricultural economy and to an industrialized and diversified economy. The simplest way to track these changes relies on classifying all economic activity into three sectors: primary (agriculture, including fisheries, forestry and animal husbandry); secondary (including mining, manufacturing, construction, and utilities); and tertiary or service (including transportation, communications, household and business services, social services and technology and education).

The first obvious change during the development process is that the share of the labor force in the primary sector declines. As economies begin to move out of low income status, and into the ranks of middle-income economies, the absolute number (and not just the share) of workers in agriculture begins to decline. The remaining farm laborers boost their productivity and are able to feed the entire country. This process continues indefinitely: a high-income country like the US has only 3% of its labor force in agriculture. Rozelle calls the decline in agriculture's share the "iron law of development." It may seem initially that agriculture plays an entirely passive role, shrinking steadily as the economy modernizes. In fact, successful developing economies typically experience modernization of the agricultural sector as an early and integral part of overall development. As will be discussed in Chapter 11, agricultural development "feeds" the broader process of economic growth in a number of fundamental ways: providing food at low cost keeps wages economy-wide at reasonable levels; releasing workers

for growing modern sectors; and providing a source of finance and markets for growing modern sectors. Healthy agricultural development leads to more rapid development overall.

Industrialization gradually changes the structure of the economy. The secondary sector, starting from a low base, grows through the initial stages of development, increasing the number and share of workers, and the share of GDP. Industry does not grow forever, though. At a certain point, the industrial share of GDP levels off. Moreover, as industrial productivity continues to rise, the share of work force in industry declines. Economies vary substantially in the relative size of their industrial sectors. However, there is a strong common pattern that for many countries, the industrial share of GDP tends to increase until a country reaches an income level of around $15,000 GDP per capita[2], evaluated at purchasing power parities (PPP: see Text Box 6-1). At this income level, the industrial share plateaus, and then begins to decline. Manufacturing—the most important part of the secondary sector—typically peaks at about 20-25% of GDP, but there is considerable variation

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Box 6.2: Purchasing Power Parities

GDP for each country is initially calculated on the basis of that country's currency, so China's GDP is calculated first in RMB. However, in order to make comparisons among countries, we need to convert GDP or GDP per capita into some common benchmark cur- rency, most often the U.S. dollar. The simplest way to do so is simply to use the prevailing exchange rate. However, conversion using exchange rates is often unsatisfactory, because the price structures of different countries can be extremely different, varying according to relative scarcities, and exchange rates can sometimes fluctuate dramatically. An alterna- tive is to calculate PPPs. For China, this means first calculating how many RMB it takes to purchase a given basket of goods and services, and then comparing this figure to the U.S. dollar cost of an equivalent basket in the U.S. economy. This ratio is then used to value the "purchasing power" of the RMB, which allows us to express Chinese GDP per capita in comparable PPP-adjusted dollars. This procedure is especially useful for evaluating living standards or the incidence of poverty, and we will use it in Chapter 9 when we discuss those topics.

In addition, when a PPP calculation is done for many different countries, it gives us a common benchmark to evaluate the development process. The computation is difficult because the bundles of goods and services produced and consumed in different economies vary quite significantly. PPP calculations require a great deal of data, and no two calculations will be exactly the same. However, a number of large comparison projects (including one by the World Bank) have produced PPP estimates according to a consistent methodology for a large number of

[2] In this chapter, PPP values refer to equivalents of 2011 US dollars, as calculated in the most recent round of the World Bank International Comparison Project.

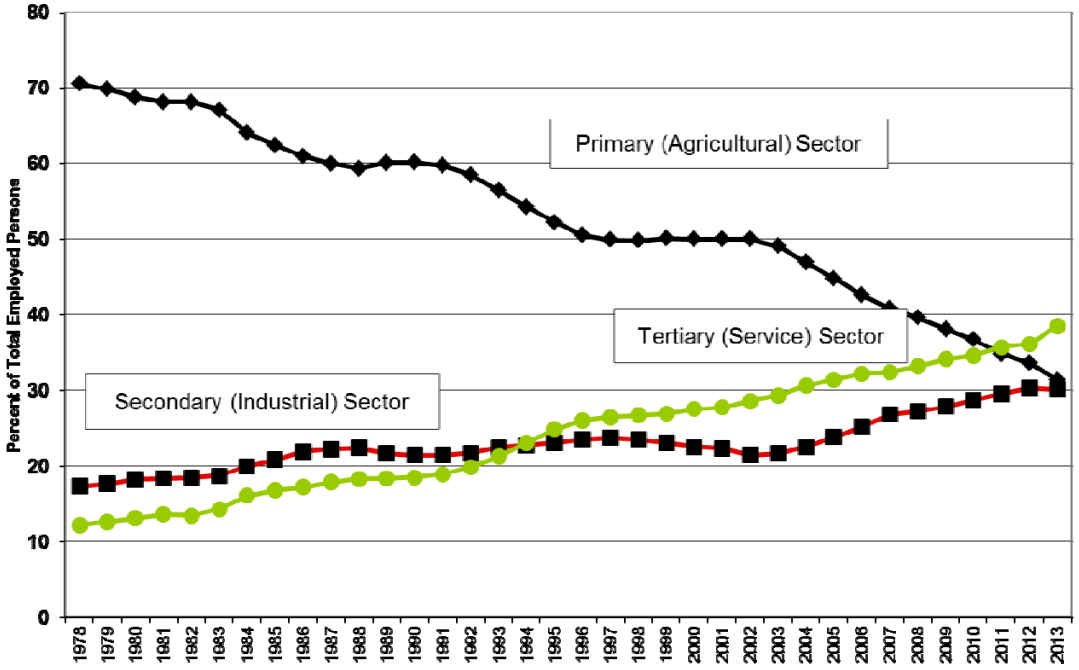
economies. The discussion of common patterns of struc- tural change in the text is based on World Bank series of PPP-adjusted GDP per capita. According to the World Bank's latest round of calculations, China's PPP-adjusted GDP per capita was $10,057, in constant 2011 dollars.

The tertiary, or service, sector displays even more diversity. During the early phase of development, the share of the service (tertiary) sector does not necessarily change by a large proportion. Many underdeveloped economies have large proportions of their labor force engaged in services. However, these are predominantly low-value jobs: small-scale retail and repair, hauling goods, and personal services. Early development in these economies may result in a declining agricultural share and an increasing industrial share without a large change in tertiary employment. However, above the $15,000 per capita PPP GDP threshold, the service sector's share inevitably increases, since the shares of both primary and secondary sectors are declining. As an economy reaches high income status, the service sector dominates. For example, in the US, with a GDP per capita of $50,000, more than 70% of employment is in the service sector, and services account for two-thirds of private consumption. Let us now see how well these patterns apply to China.

6.2.1 Structural Change in China: Labor

For most of the last 35 years, structural change of the labor force took place in the context of unrelenting pressure on the employment-generating capability of the economy. The ability of the growing modern sector to absorb labor was the key determinant of the economy's ability to transform itself.

Figure 6.3 Structural Change in Employment



As Figure 6-3 shows, at the end of the planned economy era in 1978, the Chinese labor force reflected both the fact of under-development, and the distortions imposed by the administrative regime that divided urban and rural. At that time, the remarkably high figure of 71 percent of the workforce was engaged in agriculture. (The overall rural share of the labor force, including rural industry and service along with agriculture was 76 percent at this time.) Following common patterns of structural change, the share of the labor force in agriculture has declined steadily since 1978. In absolute terms, the maximum number of farmers was in 1991 (391 million), and the number has fallen steadily to 242 million at the end of 2013. Especially rapid bursts of structural change took place in three periods: from 1983 through 1987; from 1991 through1996; and after 2003 through 2013. The first burst followed the early success of rural reforms: as collectives were disbanded and farm output surged in the early 1980s, millions of farmers left to take up new non-agricultural jobs, especially those in township and village enterprises (Chapter 12). The second burst occurred in the early 1990s, when a new round of economic reforms kicked off a growth surged and restrictions on rural-to-urban migration began to be significantly reduced across the board. The third burst corresponded with the 2003 acceleration of the economy, attributable to investment acceleration and rapid growth of exports. At the same time, as shown in Chapter 5, migration increased substantially. Periods of more rapid economic growth are also periods of expanding opportunity for rural workers, and of accelerating structural transformation. Since the share of agricultural workers fell below 50% after 2002, it has fallen steadily to only 31% in 2013. China is thus no longer a predominantly agricultural economy.

Figure 6-3 also shows the slow, gradual growth of China's late developing service sector. The share of workers in services in 1978—merely twelve percent—was astonishingly low. There is some undercount involved here, since statisticians are unlikely to have captured all the employees of urban industrial work units who were actually providing services to other work unit employees. But it is undoubtedly true that, as noted in Chapter 3, socialist development involved a neglect of investment in the service sector, and discrimination against individual service providers. Given that background, it would be expected that market transition should create a dramatic expansion in service sector employment. Figure 6-3 certainly shows vigorous service sector growth, as its share of the work force has climbed steadily. Nevertheless, given the depth of suppression of the service sector pre-1978, one could have expected an even more impressive growth. Most middle income developing countries have a much larger service sector, and typically have half or more of their labor force in services. Reforms, for all the dramatic change they have created for China's economy, have had a slow and relatively weak impact on increasing the employment of service sectors. This aspect of the structural growth pattern may be both a shortcoming and a potential opportunity in the future. The shortcoming is that while market opening and diversification proceeded strongly in goods producing sectors (primary and secondary sectors), the government has maintained near monopoly controls over a number of higher-skill service sectors, including those relating to finance. This in turn reflects lost

opportunities to restructure and open those sectors, and reap greater productivity gains. However, the fact that these sectors already exist but still have huge potential productivity gains from further reform and opening means that additional growth impetus is available by extending reforms to the service sector, especially finance, technology, and business services. The data show service sector employment increasing rapidly after 2010 and, if sustained, this would be a good sign for the economy.

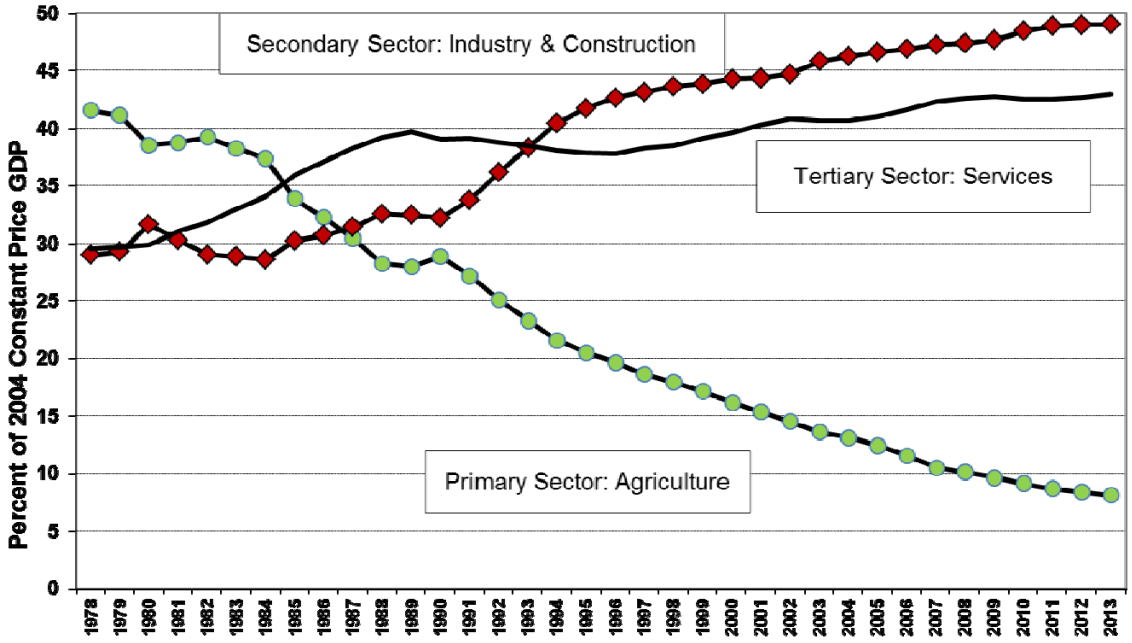
6.2.2 Structural Change in China: GDP

Structural change can be view through the changing shares of total GDP produced by the primary, secondary and tertiary sectors. Unlike in the case of labor, which we could measure simply by counting bodies, GDP must be measured in value. Therefore, we must choose an appropriate price standard for comparison and properly treat changing prices over time. These issues are particularly important in the case of China because the "Big Push" socialist development strategy imposed distortions both on the price system and on the true structure of the economy. As discussed in preceding chapters, the priority placed on industrial development, and the need to ensure a source of budgetary revenues, led the socialist government to follow a high price policy for industrial output. Prices of agricultural products and services were, in relative terms, undervalued. At the same time, though, planners followed a development strategy that actually did give priority to industrial investments, and under-emphasize investment in agriculture and services. The result of this mis-pricing is that China's GDP in 1978, measured in the prices of that year (1978), was apparently dominated by industry, which produced 48% of total output, while agriculture produced only 28% and the service sector 24%.

Working at those distorted, government-set prices, an industrial worker produced seven times as much value as an agricultural worker. During the post-1978 reforms, many of the distortions imposed on the price system by the government pre-1978 were eliminated. The gradual opening of the economy to competition and international trade, and the elimination of government price controls drove down the relative price of manufactured goods, compared to services and agricultural products. Industry displayed the lowest rate of inflation, while at the same time enjoying the highest real growth rate in the economy. Price changes and real growth rates were thus negatively correlated in China. This is a common phenomenon observed in growing economies, but the effect is especially large in China because the initial period price distortions were very big, and growth has been especially rapid.

The negative correlation between price and real growth means that the output of the three sectors in China has grown at roughly similar rates when valued at current prices (since higher growth tends to offset lower price inflation, and vice versa). As a result, measured at current prices, the sectoral composition of GDP in China seems to display no consistent trend. Instead, we must use constant prices from a relatively recent year: recent prices are closer to world prices, and so provide a better benchmark than early highly distorted prices. When we do so, using the implicit sectoral GDP deflators to revalue sectoral output to a constant price basis, the long-run

Fig. 6-4: Composition of Chinese GDP

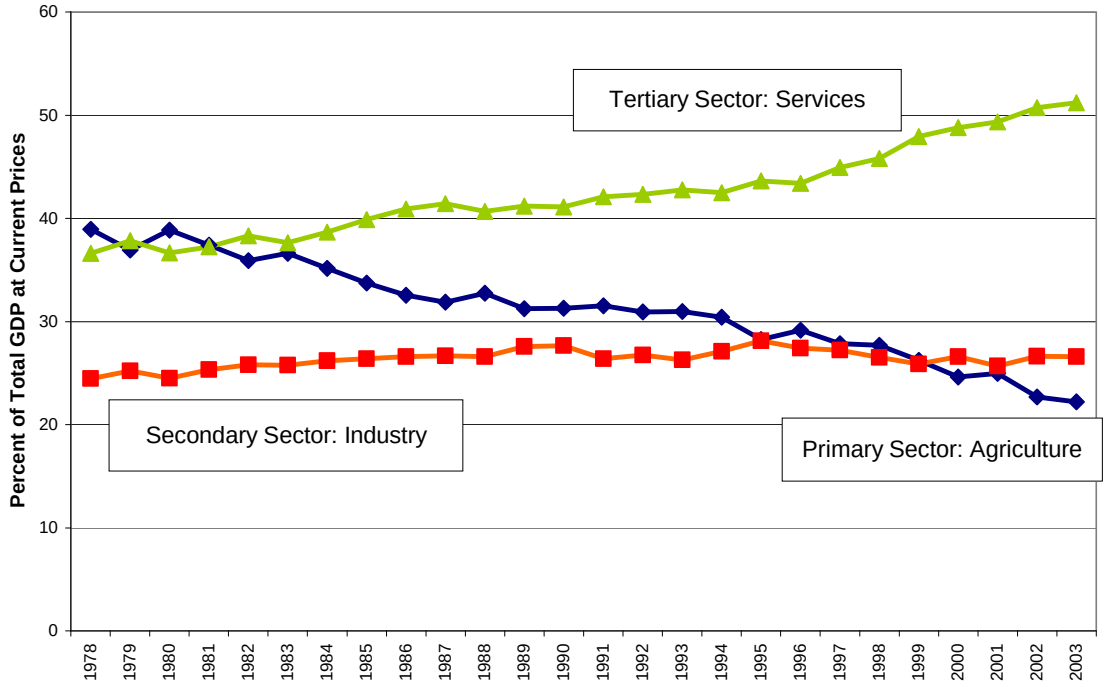


pattern of structural change emerges clearly. Figure 6-3 uses prices from 2004 to measure structure and structural changes from 1978 through 2013. It provides a more accurate picture of the structure of the economy in 1978. Measured in 2004 prices, agriculture produced 42% of GDP, while industry produced 29%. At 2004 prices, industrial workers were about twice as productive as the economy average, and agricultural workers half as productive. While China was still an "early" industrializer—relative to its GDP per capita, it is not as extreme an outlier as one would conclude by looking at current price data.

Figure 6-4 now displays a clear picture of structural change post-1978. Generally speaking, two periods are discernable, which we might label "recovery" and "rapid industrialization." During the recovery period, from 1978 through 1991, structural change was moderate because agriculture and services both grew rapidly. Agriculture maintained share during the first six years as reforms succeeded first in the countryside; and the service sector showed strong recovery from its suppression during the command economy period. The subsequent "rapid industrialization" phase began after the renewal of economic reform in 1991. Driven by linkage to the global market, the share of GDP originating in industry moved steadily upward from 32% in 1990 to an extraordinary 45% in 2002, and then continued to march upward until it leveled off at 49% of GDP after 2010. Indeed, the industrial boom was so overwhelming that the share of services, which we would normally expect to be increasing in a rapidly growing economy at China's income level, actually declined one percentage point between 1988 and 1998, before resuming moderate growth. Agriculture's share of GDP, as one would expect, has

resumed its rapid decline, slipping from 27% of GDP in 1991 to 8% in 2013. (As measured in constant 2004 prices). China is no longer a predominantly agricultural economy, but the modern service sector has still lagged behind the rapidly growing manufacturing economy: we are now probably on the threshold of a third phase in which services begin to grow rapidly and industry declines as a share of GDP.

Fig. 6-5: Composition of Indian GDP



China's industrial share is extremely high. Industry includes mining, petroleum extraction and utilities, which of course vary substantially across countries, and which are not particularly large in China. A more precise comparison is thus with the share of manufacturing value-added in GDP. Although Chinese data on manufacturing are less consistent than we would prefer, manufacturing accounts for about 85% of industry value added. At this rate, China's manufacturing value-added has increased steadily and has been just at or slightly over 35% of GDP since 2007. This is not the highest share of manufacturing in GDP ever recorded, but it is the highest share ever sustained for a long period by a large country. Only a few countries have concentrated 35% of GDP in manufacturing, and these only for a short time (Brazil in 1982 and Thailand in 2003; Malaysian manufacturing accounted for 33% of GDP in 2000). While China's *level* of manufacturing is unusual in comparative context, the pattern of change appears quite normal. China's per capita PPP GDP is approaching $15,000 (it should reach this level in about 2017). By international patterns, the share of manufacturing will then level off as GDP reaches this level. This is what we seem to be observing in China. Since China abandoned the Big Push strategy, both its investment rate and its manufacturing share have risen to unprecedented highs.

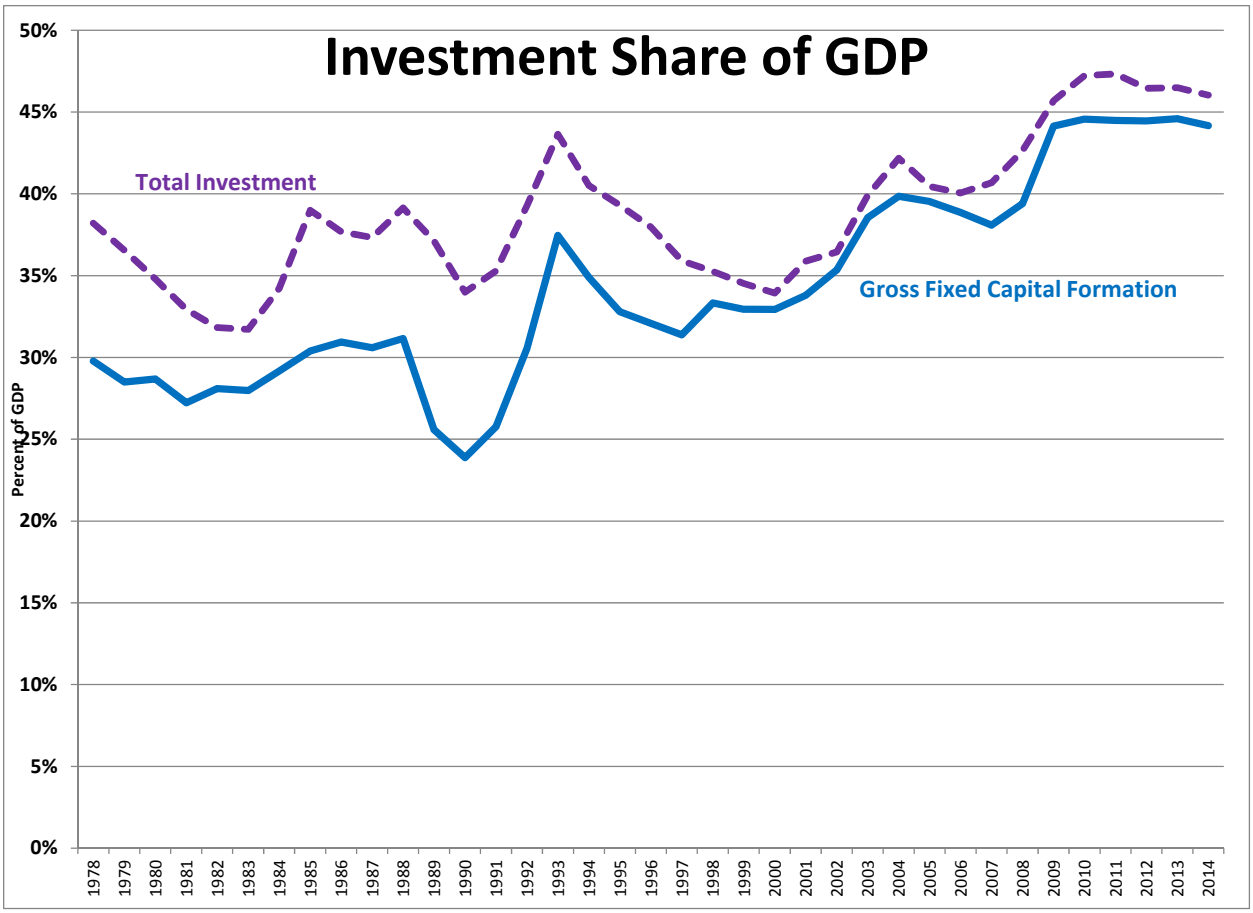
6.2.3 Structural Change and Globalization: Comparison

It is clear that China's high manufacturing share is closely related to its emergence as "the world's factory." Globalization changes some of the patterns of structural change. As China emerges as a favored site for certain types of manufacturing world-wide, and as it clusters certain stages of Asia-wide manufacturing networks, it clearly can continue to expand its manufacturing sector for a longer period than if it were not so integrated into world industry (Chapter 16). An instructive contrast, touching on globalization and also on economic development patterns, is with India. The pattern of structural change in India is shown in Figure 6-5. Like China, India shows a steady decline in the share of agriculture in its overall GDP. But the relationship between change in industry and services is reversed in the two economies. In India, industry's share has remained roughly constant, while services have climbed to more than 50% of GDP. Each company has established a comparative advantage in one broad sector, and then developed in a pattern that expanded that comparative advantage sector. In that sense, globalization and international trade create additional opportunities for specialization and apparently "unbalanced growth" that would not exist in an economy less integrated with the world. To be sure, India may also be said to have unintentionally discouraged the manufacturing sector: by restricting large-scale factories; under-investing in infrastructure; and limiting foreign investment, India has until recently hobbled its industrial sector. Luckily, intelligent and entrepreneurial Indians were able to exploit opportunities where policy did not create such large barriers, and which was consistent with India's factor endowment.

6.3 Investment

6.3.1 Overall Patterns of Investment

Closely related to China's rapid growth is the enormous investment effort China has made over the past thirty-five years. Indeed, ironically, since China has abandoned the "Big Push" socialist development strategy, her investment rate has actually risen. Indeed, the output of this investment effort is what most strikes the visitor to China: the pace at which new buildings, airports, power lines and other infrastructure appear provides striking visual testimony to China's elevated investment rate.



The high rate of investment is the most immediate explanation for China's rapid growth. The basic facts are shown in Figure 6-2, which shows total investment and its most important component, fixed capital formation (shown in a solid line), which corresponds to the new factories, roads, and housing and which is fundamental to economic growth. Gross fixed capital formation was already around 30% of GDP at the end of the 1970s, and stayed in that range through most of the 1980s. Fixed capital formation increased through the 1990s, and then took a jump upward after 2002. Between 2003 and 2008, fixed investment stayed in a tight range between 38% and 40% of GDP. Then, something remarkable happened: in 2009, in the face of the global financial crisis, China launched a government stimulus program. This pushed fixed investment up above 44% of GDP, where it has remained through 2015.[3]

In international experience, China's high investment rate through 2008 was rare, but not completely unprecedented. Investment rates as high as 40% have been observed before, but only in exceptional circumstances. The two previous episodes of rapid growth in East Asia described in the previous section were also characterized by high investment. Japan invested 35-37% of

[3] Note that China's GDP revisions in 2015 reduced investment rates by two to three percentage points, partly because they began to impute services from owner-occupied housing to consumption (as they should be). The numbers have been revised from earlier publications, but the qualitative judgments are unchanged.

GDP in gross fixed capital formation during 1970-1973 at the very end of its long boom. Korea sustained a very high fixed investment rate from 1990 through 1997, peaking at 39% in 1991. For brief periods in the mid-1990s, Thailand and Malaysia invested over 40% of their GDPs in fixed capital (1993-1996 and 1995 respectively). Thailand and Malaysia achieved their very high investment rates to a significant extent by relying on inflows of foreign direct investment, which equaled 5-6% of GDP. The previous higher investor was tiny, highly open Singapore, which enjoyed massive foreign investment inflows to reach a total investment share averaging 42% over fifteen years from 1971 to 1985. China has also enjoyed significant inflows of foreign investment but, unlike Thailand, Malaysia and Singapore, has not run an overall current account deficit for a long time. Thus, on balance, Chinese investment is fully financed through Chinese domestic saving.

Why is Chinese investment so high? To be sure, many of the reasons are rooted in market fundamentals. Chinese saving is high: households, businesses foreign and domestic, and government all contribute to the supply of saving, making high investment possible (Chapter 19). Moreover, investment opportunities are abundant. However, it should also be said that investment is high because the Chinese government has long seen investment as the key to growth, and growth as its most important objective. As a result, the Chinese government has adopted as series of policies designed to keep investment high. These include:

1. Keeping the cost of investible funds low through subsidies and "financial repression" (Chapter 19). A series of credit, tax and financial policies have been used to steer funds toward entities (usually government-linked) with high investment propensities.

2. Cost deferral. Government has encouraged productive investment by shielding investors from environmental costs, land costs and energy costs. In essence, the cost of factors of production is held down by conscious government policy.

3. Target responsibility systems. Local government leaders have been given growth targets to which their promotion possibilities and short-run bonuses are linked. In practice, they only way for local officials to maximize these success indicators is to increase investment (See Chapter 18).

China has created a growth-oriented polity, and it has produced high investment and growth. It should certainly be noted, however, that many of these policies defer costs to the future, at which time they will eventually have to be paid.

6.3.2 The Relationship between Investment and Growth

High investment is a major explanatory factor and pre-condition for rapid growth in China, as it has been in previous episodes of rapid East Asian growth. Clearly, a big part of the answer to the question, "Why is China growing so fast?" is simply, "Because the investment rate is so high." We can better understand China's experience—and in turn use the Chinese example to

shed light on global economic growth—by looking at some of the basic relationships between investment and growth. Particularly during the 1940s through the 1960s, economists examining development and growth tended to see investment as the key to growth. Development economists argued that the first task of development was to increase investment from less, say 5% of national income, up to 15% of national income or more. (Today, most economies already invest more than 15% of national income, and China, obviously, invests much more than this.) The simplest possible growth model, called a Harrod-Domar model, is one that includes only fixed capital as a source of growth. This simple model can make sense if (and only if) labor is so abundant that labor to work the new capital is always available without significantly increasing costs. For example, if there is a pool of "surplus labor" in the country-side, eager for the opportunity to work at jobs in the modern sector, then investment can be increased without running in to diminishing returns. In such an environment, the investment rate is the sole determinant of the growth rate.

Supposing that these conditions hold, a simple model can be created based on a constant capital/output ratio. That is, set a parameter, k = K/Y, where small k represents the number of units of capital (K) required to produce each unit of GDP or income (Y). In a reasonably well functioning economy we might expect this capital/output ratio to be a number between roughly three and six. Assume that in a given economy, such as China, this ratio is fixed in the short-term and equal to four. In that case, once we know the capital stock, we know the level of output. Output (GDP) is given by the capital stock:

$$Y = 1/k*K$$

Growth of output is then given by the increment in the capital stock:

$$dY = 1/k * dK$$

The growth rate is then derived by dividing both sides by Y:

$$dY/Y = 1/k * dK/Y$$

Since (ignoring depreciation), dk/Y = Investment/Y, it is convenient to re-label it "i," for the investment rate. Finally, dY/Y is the growth rate, which we can call "g." That gives us growth is a linear function of investment:

$$g = i/k$$

Suppose that in China, the value of "k", on average was 4 (a fairly typical middle income value). That means that as the investment rate was pushed up to 40% of GDP, the growth rate of the economy as a whole approached 10% (10% = 40%/4). Clearly, this simple relationship captures something important about the Chinese growth experience.

While illuminating, this perspective is too limited. In the first place, international experience shows that the relationship between investment and growth is not so straightforward, and cannot explain very much of the variation in the growth experience across countries. A significant investment effort is a prerequisite to growth, but today virtually all economies invest more than 15% of GDP, and yet some are growing robustly while others are not growing at all. In fact, even for a single economy, the investment rate tends to be relatively persistent over the long term, but countries' growth rates can fluctuate dramatically (as indeed China's experience demonstrates). While there is definitely an association between investment and growth, the relationship is neither as strong as we might expect, nor is the causality as clear as predicted (Blomstrom, Lipsey and Zejan 1996; Easterly and Levine 2001). The East Asian growth experiences clearly depend on a significant investment effort, but not necessarily on the extremely high investment rates that characterize China or Korea. The economy of Taiwan, for example, has achieved very rapid growth, but fixed capital formation was only occasionally pushed above 30% (and the last time was in 1980).

Instead of treating the capital-output ratio as a fixed parameter that explains growth, we can derive additional insight by converting it into a variable the expresses the productivity with which capital is used. That is, we keep the simple expressions developed earlier, but turn them around to provide empirical information about the economy's performance. Multiplying our previous expression by k/g, we derive:

$$k = i/g$$

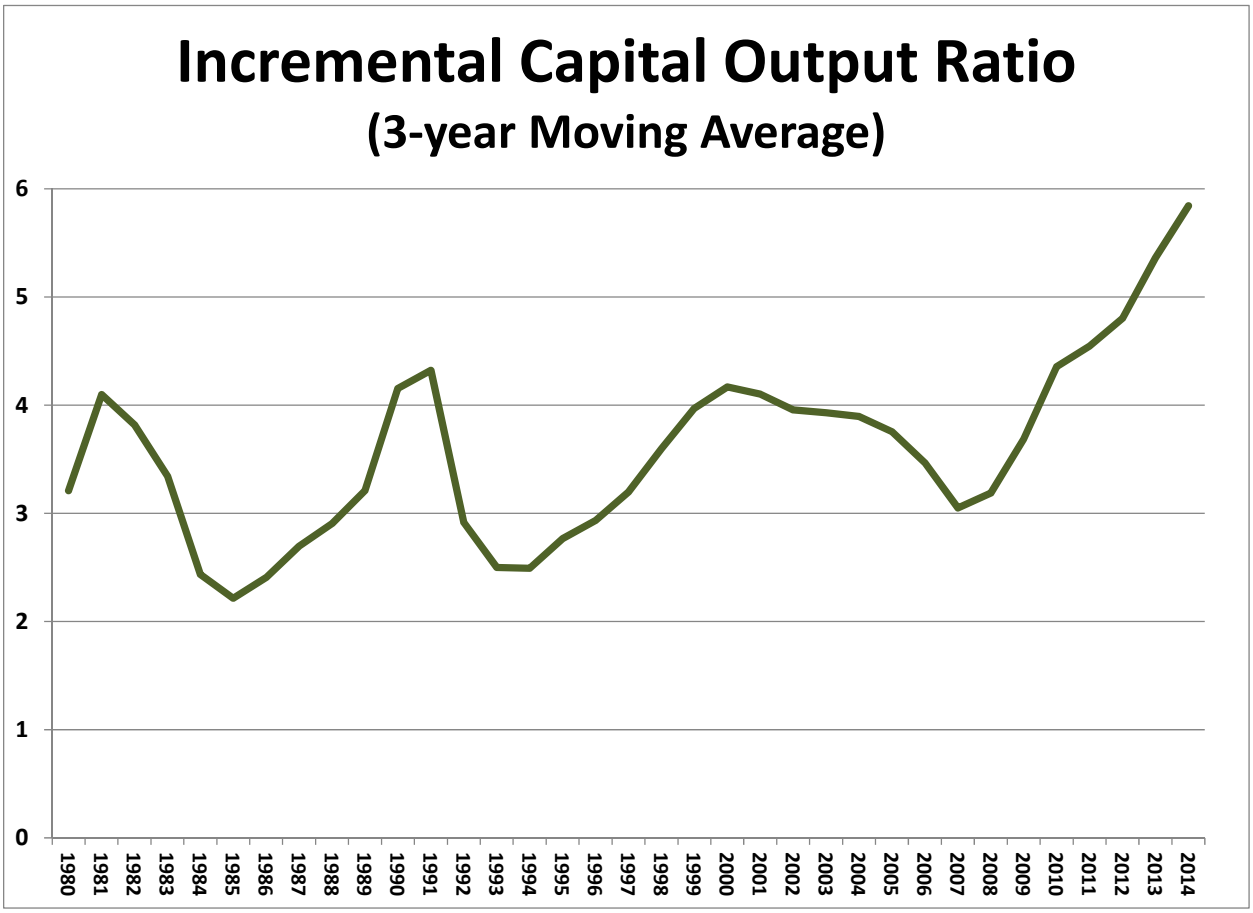
In this expression, k is no longer a constant capital/output ratio, but rather an empirical observation about the number of units of capital it actually took to provide an additional unit of output. Called an "incremental capital-output ratio," this measure provides a "quick but dirty" assessment of how much investment is required to "grow" the economy. The lower the number, the better. The long-run average ICOR for India was 4.1, and for all "Lower Middle Income" countries was 4.3. ICORs for developed countries are typically much higher.[4] For the US between 2002 to 2012, private investment in structures and equipment was 10.8% of GDP, and growth only 1.8%, so the average ICOR was 6). In fact, for China the results are:

[4] For a developed country, a larger share of investment is needed simply to maintain the existing capital stock (that is, to offset depreciation); a larger share of investment goes for non-productive assets like housing; and there are fewer opportunities for "catch-up" or "copycat" investment. For these reasons the ICOR is expected to be higher.

Table 6.2: Incremental Capital-Output Ratio (ICOR)			
	(Trailing Five-Year Average)		
	Fixed Investment (Percent of GDP)	**Growth Rate (Percent of GDP)**	**ICOR (Annual Average)**
1979-2000	30	9.7	3.1
2000-2010	39	10.3	3.8
2010-2014	44	8.6	5.2

Table 6.2 shows that over the long run, China has used investment relatively efficiently. The average ICOR between 1979 and 2000 was only 3.1, significantly lower than the middle income average. As China stepped up investment in the 2000-2010 decade, the ICOR rose, but only slightly, and China was still slightly below the international average, despite having a very high investment rate. As a result, growth accelerated slightly from already high levels. After 2010, China's ICORs have increased, surpassing 5 for the five-year period 2010 to 2014.

An ICOR is affected by short-run fluctuations in the GDP growth rate. If GDP growth drops in a single year, the ICOR for that year will spike. To control for this effect, Table 6.2 displayed long-run ICORs comparing average growth rates over at least five years with long-run investment rates. However, the short-run fluctuations in ICORs also provide information. Figure 6.X shows ICORs averaging over only three years (of growth and investment). The figure shows clearly the three extraordinary periods around 1984-85, 1993-94, and 2007-8 when, due to extraordinary circumstances, growth surged (and ICORs dropped to 3 or below). Especially in the first two cases, ICORs could drop so low because resources previously bottled up in the countryside were being released, so very little investment was needed to facilitate growth. Conversely, the figure shows that the increase in ICOR after 2010 has been steep and without precedent in the reform period. Some of the increase in ICOR after 2010 is the unavoidable result of the maturing of the Chinese economy (ICORs tend to increase with development). However, some of the increase is due to the rapid change in economic conditions in China, the end of the "growth miracle" phase, and the difficulty of adapting a new growth strategy. One benefit of the ICOR is that it gives a quick and simply indicator of investment productivity. As soon as aggregate data are available for 2015 or 2016, the reader can easily calculate a short-term ICOR, and update the trends shown here. Will China's ICOR go up beyond 6?



6.4 Production Functions, Productivity and Growth Decomposition

In examining the relationship between investment and growth, we have been examining productivity in terms of a single input, capital. In a parallel fashion, discussions of productivity in the U.S. often focus on labor productivity, in which output is compared to the single input, labor. In fact, to pursue the analysis further, we need to take into account the obvious fact the output is produced by several different factor inputs. We need to put these inputs together into a production function:

$$Y = f(K, L, H, \ldots.)$$

This says output (Y, or GDP) is a function of inputs of capital (K), labor (L) and human capital (H). Capital, labor and human capital are the most important factors of production that are inputs

into the production process.[5] By explicitly setting up a production function, we can quickly achieve two analytic objectives:

1. Growth Decomposition: We can use the production function to investigate how much of past growth can be attributed to measurable increases in factor inputs. That is, how much growth came from the increase in labor? From human capital? Etc.

2. Total Factor Productivity: When we have calculated the total amount of growth that can be attributed to factor inputs, we will still be left with an unexplained component or "residual." This tells us how much of growth we cannot explain by measurable increases in factor inputs. We call it "total factor productivity growth" or TFP growth, because it tells us how much *more* output we were able to produce with a given measure of inputs (which includes all the essential factor inputs).

In order to achieve these objectives, we need to give the production function a specific form. The specific form we adopt should have at least two essential characteristics: it should display overall constant returns to scale, and it should display diminishing returns to scale for any single input. The most straightforward way to accomplish this is through a Cobb-Douglas production function:

$$Y = A * K^{\alpha} * L^{\beta} * H^{\gamma}$$

In which $\alpha+\beta+\gamma=1$, and α, β, and γ are each less than 1. The restrictions fulfill our requirements of overall constant returns to scale and diminishing returns to each factor respectively. The coefficients show the marginal productivity of each input.[6] Even within the Cobb-Douglas form, there are a number of different specifications possible. In a competitive market economy, we can assume that businesses will employ each factor of production up to the point where its marginal productivity is exactly equal to its cost. At the aggregate level, that would imply that the share of the wage bill in the overall economy would equal β plus γ, and the share of capital would equal α (otherwise, entrepreneurs would shift a dollar's worth of input from wages to capital, or vice versa). These values provide plausible ranges, but cannot really be applied in the Chinese economy, given the huge government role and the multiple distortions in factor markets. The marginal products could be estimated directly from the historic data, but given limited numbers of observations and large institutional changes, this is also not very promising. The best recourse is probably just to assign plausible and reasonable values to the coefficients. This is the procedure followed by Perkins and Rawski (2008), in the results we display below.

[5] Land is also an essential factor of production, which we set aside here because it typically changes so slowly. See Chapter 8 for further discussion of human capital

[6] Experiment with the functional form by multiplying all inputs by a common integer, then re-arranging terms. Plug in plausible values into a spreadsheet and look at the results.

Once the decision is made on what values of the coefficients to use, and all the data has been collected and properly processed, it is straightforward to calculate the growth of inputs ("total factor inputs," as it were) and then the residual. To do this smoothly, first convert the production function into logs:

$$\ln Y = \ln A + \alpha \ln K + \beta \ln L + \gamma \ln H$$

We can then express any subsequent value of Y and the inputs K,L, and H in terms of their growth rates, in which a capital G denotes a percentage growth rate[7]:

$$G_y = G_A + \alpha G_K + \beta G_L + \gamma G_H$$

Rearranging terms, we have

$$G_A = G_y - (\alpha G_K + \beta G_L + \gamma G_H)$$

The last of these expressions says that we can define a "residual" term, G_A, which is the growth of output minus the growth of a weighted basket of inputs. That is, the residual G_A refers to the unexplained growth of output after we have accounted for measured factor inputs.

What is this residual? We label it "total factor" productivity, because it measures the change in the productivity of all the factors put together. It is common to equate TFP with technological progress, but this is too simple. Although technological progress is certainly an important part of TFP, the reality is that TFP is a residual, and thus a measure of things that we cannot fully explain or account for. Nevertheless, we can immediately identify at least three important components of TFP:

(a) Technological progress: when new "blueprints" are available, such that new production techniques or processes can be introduced that use fewer inputs per unit of output;

(b) Institutional or organizational progress: when new incentive systems and coordination techniques are implement that make people work smarter or harder;

(c) Reallocation of factors: when workers move from one sector to another, or from one firm to another where their productivity is higher. In a market economy, lower productivity firms go bankrupt and release factors to higher productivity firms. In a developing economy, workers leave low productivity agriculture and move to higher productivity industry or services.

[7] We can be comfortable dropping the log notation because of an important "short cut": that if X is a number near one, then the approximation $\ln(X) \approx X-1$ is roughly correct. Therefore, the log of 1.05 is roughly .05, and the log of 1.1 is roughly 0.1. Of course, we can retain the precise log computation when appropriate, but use the short cut in quick calculations.

Keeping in mind that there are multiple causes of TFP growth, it is still meaningful to track the performance of China's economy in terms of TFP growth. Table 6.X shows one version.[8] Perkins and Rawski's calculations tell a story about China's entire post-1949 growth experience. Between 1952 and 1978, growth of inputs was fairly rapid, but after 1957, productivity performance was terrible. TFP *declined* by 0.5% annually, such that output in 1978 was 10% lower per a given total factor input than it was in 1957. After the beginning of the reform era, TFP growth rebounded to 4% annually, making up X proportion of growth. Moreover, capital accumulation accelerated at the same time.

China GDP Growth and TFP

Period	GDP growth	Fixed Capital	Labor	Human Capital	TFP
1952-1978	**4.4%**	**5.8%**	**1.9%**	**2.5%**	**0.5%**
Of which: 1952-1957	6.5%	1.9%	1.2%	1.7%	4.7%
1957-1978	3.9%	6.7%	2.0%	2.7%	-0.5%
1978-2005	**9.5%**	**9.6%**	**1.9%**	**2.7%**	**3.8%**
Of which: 1978-1995	10.2%	8.9%	2.3%	3.2%	4.0%
1995-2005	9.1%	11.5%	1.0%	1.7%	3.2%

Source: Perkins and Rawski 2008

This calculation shows that TFP was positive and significant for China during the 1978 to 2005 period. However, it was not the *main* source of growth in this period. The main source was growth of fixed capital, or investment. [Show exactly how this can be derived from the table; decide on a best growth de-composition example.]

[8] Note that there are many possible versions of this type of calculation. Each analyst must decide which price deflators are most appropriate, how to handle index number problems, and the appropriate size of the individual coefficients.

6.5 What is a "Growth Miracle"?

In an earlier section, we defined a "growth miracle" as a period of at least fifteen years in which per capita GDP grew at over 6% per year. In fact, such growth miracles display a common feature: very rapid growth of all factor inputs, combined with positive TFP growth. This feature was first emphatically asserted by Young (xx) and Krugman (xx) who argued, provocatively, that the Asian miracle was not miraculous because TFP growth rates were in fact rather ordinary. This is a factually correct assertion, but a rather dubious semantic point. The Asian growth miracle is indeed miraculous, but because of the growth of output and incomes, not because of the growth of productivity per se. Krugman elsewhere has said, "productivity is not everything, but in the long run it is almost everything." This is well put, but we can also turn it around. In the early stages of growth, productivity is not nothing, but it is almost nothing. That is, no poor country ever escaped from poverty by relying on productivity improvement. It is not even really conceivable: only by mobilizing labor and new fixed capital can a country begin the development process. In "growth miracles" productivity is still not the main thing. Rather, taking advantage of a set of economic conditions to create a sustained rapid growth of inputs is the main thing. Productivity growth should be positive to sustain this process, but it is not the main driver. In this, China resembles earlier growth miracles.

In growth miracles, we typically see rapid increase in labor (L), capital (K), and human capital (H), along with positive TFP growth. How can this be? In fact, the rapid growth of all three of these factor inputs comes precisely because growth creates a virtuous cycle, in which rapid growth supports further rapid input growth. The process begins with a "demographic dividend," described in Chapter 7. The population at working age increases rapidly and dependency ratios drop, output per capita growth accelerates. With this acceleration, the incentive and opportunity for households to invest in physical and human capital increases. With few dependents, households invest more in education for each child, and saving rates rise permitting more financial and physical investment. To sustain this process, it is essential that governments adopt an open economic policy. The open policy permits output to grow essentially without limits (since world market demand is almost infinitely elastic, even for a big country like China). The open policy also enables the inflow of foreign technologies, hard and soft, and new business models. In this accommodating environment, government actions to increase investment in productive capital and infrastructure are generally successful. It is not hard to see where the economy is going. Migration from agriculture provides an infinite supply of labor, and the investment rate drives the overall growth of the economy. These features have been the common experience of all "growth miracle" economies.

It is clear that China's "golden age," from 1978 to 2010, fully fit these conditions. First, China enjoyed the "demographic dividend," of having a large and increasing share of the population at working age, and a low dependency burden. Moreover, the demographic dividend was in place just as the structural transformation from agriculture to industry gained steam. Under these circumstances, the amount of new capital provided by investment was the key driver of growth: as the machines and structures were put in place, there were plenty of farmers ready to move to factory jobs, and as they did so, productivity and total output grew. Investment was the key facilitator of this process of structural change. As rural-to-urban migration became large, China's economy shifted into over-drive.

Second, in China's "follower" economy, there were myriad opportunities for transplanting business models, technologies, and infrastructure patterns from developed countries. Businesses were rewarded for moving fast, and planners could adapt infrastructure solutions from developed countries. China built out grids of highways and electric power, and later airports and high-speed rail. The basic pattern and scale of these infrastructure solutions were copied wholesale from developed countries. Chinese policy-makers argued that it was more important to build these networks quickly than it was to have each node in the network appropriately adapted to local demand. They were right: China built out infrastructure ahead of demand and drove the growth process. Moreover, during the course of the 1990s, the institutional set-up was adapted, in myriad ways, to support the high investment imperative. The system delivered investment, and investment delivered growth.

Third, these processes were already well underway when two dramatic changes in the structure of demand took over in the 2000s: the housing boom and the restructuring of China's export economy. Both of these changes in the structure of demand should be recognized as imperfectly foreseen outcomes of the reform process China undertook in the 1990s. The housing boom developed after the privatization of urban housing at the end of the 1990s. Capital-intensive steel, cement and aluminum industries expanded enormously to meet the demands of the housing boom, and this expansion required investment. The housing boom affected both saving behavior and investment. Chinese households increasingly began saving in order to afford housing; investment in construction soared, and derivative investment in supporting heavy industries increased as well. China's foreign trade changed dramatically after membership in the World Trade Organization (WTO) began to phase in after 2001. WTO membership brought a wholesale re-organization of China's traded goods sectors. Liberalization did not so much produce a flood of imports as it did a flood of new ways to produce industrial goods cheaply and efficiently. With imported parts and components, China's industry cut costs dramatically. Export growth accelerated to 30% per year after 2003, and this was only part of the story. The other part of the story was rapid import substitution, concentrated in the machinery industry. China imported fewer foreign machines, and greatly expanded its domestic machinery industry. Construction machinery firms such as Sany and Zoomlion developed thriving businesses; listed on overseas stock markets; and made overseas acquisitions.

6.6 The End of the Growth Miracle

There are numerous signs that the favorable conditions that supported China's miracle growth phase are coming to an end. It is most obvious with respect to labor market conditions, which are discussed in Chapters 7 and 8. It may also be true with respect to the ease with which planners can build infrastructure out ahead of demand: as the highways, airports, and high-speed rail networks are completed, will there be a new wave of infrastructure that planners can use to keep investment high and drive growth forward? It seems unlikely. Finally, as wages climb rapidly (due to the combination of rapid growth and changing labor force conditions), China is losing some of its absolute comparative advantage in labor-intensive manufactures. This implies that expansion of net exports will cease to be an important growth driver in the coming decades. Put together, these factors indicate that China is likely to experience a slowdown in investment growth, the beginnings of a reduction in the share of manufacturing in the economy, and a long-term lower growth rate.

For several years, Chinese policy-makers tried to resist this tendency of the economy toward a slower long-run growth trajectory. In the face of the Global Financial Crisis (2008-2009), growth was maintained by large increases in investment. Presumably the ultimate efficiency of these investments will be comparatively low, and there will be additional costs down the road. Those costs include not only the creation of non-viable investments, but also the financial strains created by financing (and then restructuring) investments that can never be self-supporting. These worries indicate that the slowdown of the economy may be more abrupt than one would like. These risks (discussed further in Chapter 19) also reflect the past experience of earlier "miracle growth" economies. When Japan, Korea and Taiwan reached the end of their rapid growth periods, they experienced substantial economic turbulence—and sometimes serious economic crises—as they transitioned to a slower growth, lower investment development path. China may also run into such difficulties.

The end of growth miracles is complicated, because so many things change at once. Most fundamentally from an economic standpoint, the long-standing comparative advantage based on cheap labor suddenly starts to diminish, and may diminish quickly. But other changes occur, more or less by chance, at approximately the same time. Urban growth creates new urban social groups with higher incomes, different consumption patterns, and new skills. New markets and new social possibilities emerge along with those groups, and they make new demands on society and the political system, as well as in consumer markets. In China, by chance, the end of surplus labor coincides with the end of absolute growth of the labor supply. Changes in the labor market will be intensified by the simultaneity of these two structural shifts.

6.8 Conclusion: Future Structural Change

The transition to a post-growth miracle "new normal" is difficult to predict because it is impossible to know how the different parts will fit together. A key focus of uncertainty is the investment rate. Investment is, of course, a "good." Growth and development cannot occur

without it. But the fact that investment is a good does not mean that a higher investment rate is always better. China today needs to "re-balance" by reducing its investment rate and releasing more resources for consumption. However, this is difficult to do.

By definition, the high investment share means that household consumption is a small share of total output. Household consumption was a little over 50% of GDP in the 1980s; and 45% of GDP through most of the 1990s; but since 2008 has been only 36-7% of GDP. Like the investment ratio, this consumption ratio is unprecedented: there is no large economy that has ever consumed such a small portion of its total output. In this sense, China's economy is very unbalanced indeed. However, it is important to clarify that this means consumption is "low" as a proportion of total output, but not "low" relative to consumption in the past. Indeed, over the past two decades, China's consumption has grown faster—much faster—than that of virtually any other country in the world. Rapid economic growth has enabled rapid consumption growth, even as consumption as a share of GDP has inched downward. If China could draw more consumption from GDP without disrupting growth dynamics, that would be a good thing.

However, concerns about China's unbalanced economy are not drawn from the desire to quickly increase consumption, but rather from the concern that the current growth trajectory may be unsustainable. As China moves out of the manufacturing stage, there is less need for investment in capital-intensive steel, chemical and building materials industries. The investment that is required increasingly needs to be smaller-scale, more responsive to immediate market demand, and more "innovative," meaning that it is more difficult to simply transplant existing production and business models. Finally, many of the really large-scale investment programs China—such as highways—has been undertaking will reach completion within the next five years. For all these reasons, investment should decline in relative terms.

Rebalancing, then, presents both a long-term and a short-term challenge. In the long-term, re-balancing will ultimately be part of China's evolution into a middle-income society. It is difficult to see how China can assume technological leadership, support a more prosperous and diverse society, and develop a healthy and sustainable environment, without a substantial economic rebalancing. In the short term, if China *doesn't* take steps to re-balance the economy—that is, if China tries too hard to keep the growth rate high—economy risks the creation and continuous re-creation of numerous asset bubbles, flimsy financial structures, and investment projects of declining quality. Such policies increase the risk of a significant financial crisis in the economy and increase the size of the shock when the inevitable day of reckoning comes. More broadly, a whole host of additional factors will come into play: how flexible is the future development model? Will China be able to move rapidly toward the technological frontier given its massive investment in human resources and technology? Will the size of the domestic market insulate China from some of the rough parts of the transition? Will the speed and abruptness of the demographic changes China faces make the transition more difficult?