CHAPTER 7

How Does Your Garden Grow?

THE WORLD OF PRODUCTION

You could say that Equatorial Guinea has been destined for obscurity. It is the smallest country in mainland Africa in terms of population, with just over 700,000 people. It is also a minnow in terms of landmass – the sixth smallest.[1] *Who is going to notice such a small country? To add insult to injury, there are no less than five other countries with very similar names – not just Guinea and Guinea Bissau in its neighbourhood but also Papua New Guinea in the Pacific and Guyana and French Guiana in South America.*

However, if Equatorial Guinea remains one of the most obscure countries in the world, it is not for lack of trying. It is the richest country in Africa, with a per capita GDP of $20,703, as of 2010. Over the last couple of decades, it has been one of the fastest-growing economies in the world. Between 1995 and 2010, its per capita GDP grew at the rate of 18.6 per cent per year – more than double the rate in China, the international growth superstar, which grew at 'only' 9.1 per cent per year.

Honestly, what more can a country do to get some attention? Invade the US? Make Scarlett Johansson the president? Paint the whole country pink? The world is really unfair.

Economic Growth and Economic Development

Economic development as the development of productive capabilities

If Equatorial Guinea has grown so much faster than China, why have we not heard of the 'Equatorial Guinean economic miracle', when we hear about the 'Chinese economic miracle' all the time?

The difference in size is one reason – it is possible to ignore very small countries, even if they are doing very well. But most people do not take Equatorial Guinea's phenomenal income growth seriously mainly because it is due to a resource bonanza. Nothing about the country's economy changed other than finding a very large oil reserve in 1996. Without oil, the country would be reduced to one of the poorest in the world once again, which it used to be, as it cannot produce much else.[2]

I am not saying that all growth experiences based on natural resources, such as oil, minerals and agricultural products, are like that of Equatorial Guinea. The economic growth of the US in the nineteenth century benefited hugely from abundant natural resources, such as agricultural products and minerals. Finland, exploiting its position as a country with one of the world's most abundant forestry resources, relied heavily on logging for its exports well into the twentieth century. Australia's growth still depends critically on mineral exports.

What makes Equatorial Guinea different from those other cases is that its growth has not been achieved through an increase in its ability to produce. The US provides the best contrast.[3] In the late nineteenth century, the US was not only rapidly becoming the most powerful industrial nation in the world but was also the world's leading producer of almost all commercially relevant minerals. But this status had not been achieved simply because the US was in possession of a lot of mineral deposits. It was in large part because the country had developed impressive capabilities to locate, extract and process minerals efficiently; until the mid-nineteenth century, it had not been a world-leading producer of any mineral. In

contrast, Equatorial Guinea not only cannot produce much else than oil, it does not even possess the ability to produce oil itself – its oil is all pumped out by American oil companies.

While it is an extreme example, Equatorial Guinea's experience powerfully illustrates how economic growth, that is, the expansion in the output (or income) of the economy, is not the same as **economic development**.

There is no universally agreed definition of economic development. But I define it as a process of economic growth that is based on the increase in an economy's productive capabilities: its capabilities to organize – and, more importantly, *transform* – its production activities.

An economy with low productive capabilities cannot even be sure of the value of what it produces

When an economy has low productive capabilities and relies on natural resources or on products that are made with cheap labour (say, cheap T-shirts), it does not just earn low income. It cannot even be sure that in the long run what it produces will be as valuable as it is now.

Machines wiping out entire professions is such a recurring theme in economic development that it does not need further discussion. Just think of the professions that have disappeared except in name today, such as weavers, smiths, wheelwrights and so on.

More importantly, countries with superior productive capabilities can even develop substitutes for natural resources, vastly reducing the incomes of countries that rely on exporting them. After Germany and Britain developed technologies to synthesize natural chemicals in the mid-nineteenth century, some countries saw dramatic falls in their incomes. Guatemala used to earn quite a lot of money by being the main producer of cochineal (*cochinilla*), the crimson dye favoured by the Pope and the European royalties for their robes, until the invention of the artificial dye alizarin crimson. The Chilean economy was plunged into years of crisis when the Haber–Bosch process was developed in the early twentieth century to manufacture chemical substitutes for saltpetre (nitrate), the country's main export at the time.

Changes in technologies are at the root of economic development

Not so long ago, if someone could command a thousand horses at the same time, carry hundreds of books in his pocket, generate intense heat without any flame, turn thousands of litres of seawater into freshwater or make clothes out of stone, people would have said he was a magician. We are *not* talking about those witch-burning folks of medieval Europe. Even in the early twentieth century, when the world was not totally dissimilar to today's, all of those things would have been considered impossible. Today, they are done routinely in many countries. Most of you will have guessed how, except for the last one, which is, unbeknown to most people, done in North Korea, where they make a synthetic fibre called vinalon, or vinylon, out of limestone.*

All these 'magical' developments have been possible only because we have constantly invented better technologies, namely, better machines and better chemical processes. Starting from Abraham Darby's coke-smelting technique in steel-making and John Kay's flying shuttle for textile weaving in the early eighteenth century, an endless stream of technologies has emerged to change the world. We discussed some of these in Chapter 3. The steam engine, the internal combustion engine, electricity, organic chemistry, steel ships, (wired and wireless) telegraphy, aeroplanes, computers, nuclear fission, semiconductors and fibre optics are only the most important examples. Today, genetic engineering, renewable energy, 'advanced' materials (e.g., graphene) and nano-technologies are emerging to transform the world yet again.

In the early days of the Industrial Revolution, new technologies were often developed by individual visionaries. As a result, until the late nineteenth and early twentieth centuries, many technologies were known by their inventors' names – Kay's flying shuttle, Watt's steam engine, the Haber–Bosch process and so on.

From the late nineteenth century, with technologies becoming increasingly complex, fewer and fewer of them have been invented by individuals. Companies started developing the capability to generate new technologies through R&D in their corporate labs. Around this time, governments also started investing actively in developing new technologies by either establishing public research labs (especially in agriculture) or subsidizing private-sector R&D activities.

Today, technological developments are the result of organized, collective efforts inside and outside productive enterprises, rather than of individual inspiration. The fact that few new technologies these days have their inventors' names attached to them is a testimony to the collectivization of the innovation process.

Technologies do not tell the whole story: the importance of work organization

Not all increases in our productive capabilities have come from technological development in the narrow sense: machines and chemicals. A lot of them are due to improvements in organizational skills – or, if you like, management techniques.

In the early nineteenth century, factory productivity was further raised by lining up the workers in accordance with the order of their tasks within the production process. The **assembly line** was born. In the late nineteenth century, the assembly line was put on a conveyor belt. The **moving assembly line** made it possible for capitalists to increase the pace of work simply by turning up the speed of the conveyor belt.

Outside industries like the automobile industry, in which one continuous assembly line basically decides who does what at which speed, improvements in the design of work flow have been an important source of productivity growth – how different machines are arranged, how different tasks are assigned to different workers, where parts and half-finished products are stored and so on. These things are taken for granted by economists, but they are still something that not every producer gets right, especially in developing countries.

The rise of Fordism, or the mass production system

In addition to organizing the flow of work more efficiently, attempts have been made to make workers themselves more efficient. The most important in this regard was **Taylorism**, named after Frederick Winslow Taylor (1856–1915), the American engineer and later management guru. Taylor argued that the production process should be divided up into the simplest possible tasks and that workers should be taught the most effective ways to perform them, established through scientific analyses of the work process. It is also known as **scientific management** for this reason.

Combining the moving assembly line with the Taylorist principle, the **mass production system** was born in the early years of the twentieth century. It is often called *Fordism* because it was first perfected – but not 'invented', as the folklore goes – by Henry Ford in his Model-T car factory in 1908. The idea is that production costs can be cut by producing a large volume of standardized products, using standardized parts, dedicated machinery and a moving assembly line. This would also make workers more easily replaceable and thus easier to control, because, performing standardized tasks, they need to have relatively few skills.

Despite making them more easily replaceable, Ford paid his workers well because he realized that his production method would not work unless there was a 'mass' market with a lot of people with decent incomes who could buy the large 'mass' of output produced. When the mass production system was widely adopted in the US and Europe after the Second World War, rising wages expanded markets, which then enabled production at a higher volume, which then increased productivity further by spreading the **fixed costs** (of installing the production facilities) over a larger volume.

The mass production system was so effective that even the Soviet Union was attracted to it. In the beginning, there was a huge debate there about its adoption because of its obvious 'anti-worker' implications. It destroys the intrinsic value of work by making it simplistic and repetitive, while vastly reducing the worker's control over his/her **labour process**; standardized tasks make the monitoring of workers easier while the intensity of work can be easily increased by accelerating the assembly line. In the end, the efficiency of the system was so overwhelming that the Soviet planners decided to import it.

Modifications to the mass production system: the lean production system

The mass production system, a century after its invention, still forms the backbone of our production system. But since the 1980s it has been taken to another level by the so-called **lean production system**, first developed in Japan.

The system, most famously practised by Toyota, has its parts delivered 'just in time' for the production, eliminating inventory costs. By working with the suppliers to raise the quality of the parts they deliver (the so-called 'zero defect movement'), it vastly reduces the need for rework and fine-tuning at the end of the assembly line which had plagued Fordist factories. It also uses machines that allow quick change-overs between different models (e.g., by allowing a quick exchange of dies) and thus can offer a much greater variety of products than the Fordist system does.

Unlike the Fordist system, the Toyota system does not treat workers as interchangeable parts. It equips workers with multiple skills and allows them to exercise a lot of initiative in deciding work arrangements and suggesting minor technological improvements. Improvements thus generated are believed to have been crucial in establishing Japanese technological superiority in industries in which quality is important.

Productive capabilities beyond the firm level are also very important

Important as they are, improved technologies and better organizational skills at the firm level are not the only things that determine an economy's productive capabilities.

An economy's productive capabilities also include capabilities that non-enterprise actors – such as the government, universities, research institutes or training institutes – have in facilitating production and improving productivity. These they do by supplying productive inputs: infrastructure (e.g., roads, fibre optic network), new technological ideas and skilled workers.

Economy-wide productive capabilities are also determined by the effectiveness of economic institutions. The institutions of corporate ownership and financial transactions determine the incentives for long-term investments in productivity-enhancing machinery, worker training and R&D. Also important are institutions that affect economic actors' willingness to bear risk and accept change, such as bankruptcy law and the welfare state, as discussed in Chapter 3. Institutions that encourage socially productive cooperation matter too; industry associations to promote joint export marketing or government research institutes providing R&D for small farms or small firms are examples.

Also relevant are institutions that determine the effectiveness of dialogue between different economic actors – government, business, unions, CSOs (civil society organizations), such as poverty action groups or consumer watchdog groups, and universities and other educational institutions. Examples include formal and informal channels of government-business dialogue, government-CSO consultation, employer-union negotiation, and industry-university cooperation.

REAL-LIFE NUMBERS

Failing to check whether growth rates are overall or per capita can distort your perspective

When you encounter growth rate figures, you need to check whether they are overall or per capita rates. This may sound like an obvious thing to do, but failure to do so can give you a rather distorted view of the world.

If you are monitoring a single economy's growth performance over a relatively short period of time, say several quarters or a few years, it may not be critical that you are using overall, rather than per capita, growth rate. But, if you are comparing different economies over a relatively long period of time, it is important that you use per capita growth rates. Between 2000 and 2010, GDP grew at the rate of 1.6 per cent in the US and 1.0 per cent in Germany. With these figures, you may think that the US has done substantially better than Germany. However, during the same period population grew at the rate of 0.9 per cent in the US and -0.1 per cent in Germany. This means that Germany has actually done better in per capita terms – 1.1 per cent per year growth rate as opposed to 0.7 per cent in the US.[4]

Why a 6 per cent growth rate is a 'miracle'

In theory, there is no upper bound to the rate at which an economy can grow. In practice, it is not easy for it to grow at all.

In Chapter 3, we have seen that per capita yearly output growth rate used to be close to zero everywhere until the end of the eighteenth century. The Industrial Revolution saw it going up to around 1 per cent per year, the 'Golden Age of capitalism' saw it going up to 3–4 per cent per year. The East Asian economies have seen growth rates of 8–10 per cent per year during their growth peaks during their 'miracle' periods of three or four decades.

All in all, the rule of thumb is that per capita output growth rate above 3 per cent is good, while anything above 6 per cent is entering the 'miracle' territory. Anything substantially above 10 per cent for an extended period (say, more than a decade) is possible only through either resource bonanza, as in the case of Equatorial Guinea discussed above, or recovery from a war, as has been the case with Bosnia and Herzegovina in the last decade and a half.

The power of compound rates

The growth rates we use are **compound rates** (or exponential rates), meaning that the increased output of every year (or quarter or whatever period is the unit of measurement) is added to the existing output. If an economy of $100 billion is growing at the average rate of 10 per cent over ten years, it does *not* mean that its output increases by $10 billion every year and the size of the economy increases to $200 billion after ten years. 10 per cent growth rate in the first year increases the output to $110 billion, but the second year's 10 per cent growth is over $110 billion, not $100 billion, so the resulting output at the end of the second year is $121 billion, rather than $120 billion. Continuing like this, at the end of the ten-year period, the economy will be $259 billion, not $200 billion.

The use of compound rate means that what may seem to be a relatively small difference in growth rates can create a large gap, if sustained over a sufficiently long period of time. If a country grows at 3 per cent per year and another grows at 6 per cent for one year, it is no big deal. If, however, this difference persists for forty years, the faster-growing economy will have become 10.3 times richer, while the slower-growing one will have increased its income only by 3.3 times. Before they know it, the citizens of these two countries will be living in worlds of entirely different levels of comfort and opportunity.

It is useful to have a rule of thumb that enables you to project the future on the basis of today's growth rate. If you have a growth rate of a country and want to know how much time it will take for the size of its economy to double, divide seventy by the growth rate. So, if a country grows at 1 per cent per year, it will take it seventy years to double its output, while it will take somewhere between eleven and twelve years for the size of an economy growing at 6 per cent to double.

Unlike economic growth, economic development cannot be measured by a single indicator

In Chapter 6, we saw how even the output figure may not be totally objective. But, given the output statistics, it is straightforward to calculate its growth rate. In contrast, there is no single number that allows us to measure economic development, defined as an increase in productive capabilities.

There are many different indexes of productive capabilities (under different names), published by international organizations, including the UNIDO (the United Nations Industrial Development Organization), the OECD, the World Bank and the World Economic Forum. These indexes are made up of dozens of different indicators that are thought to reveal various aspects of a country's productive capabilities. Most frequently included are indicators regarding the structure of production (e.g., share of hi-technology industries in total manufacturing output), infrastructure (e.g., broadband connections per capita), skills (e.g., the share of workers with a university degree) and innovation activities (e.g., R&D spending as a share of GDP or number of patents per capita).

However, being made up of such diverse elements, these indexes are difficult to interpret. Therefore, unless you are a professional economist, you are better off with simpler indicators that are easier to interpret. I talk about two of them below.

Share of investment in GDP is the key indicator of how a country is developing

In order to be used, most technologies have to be embodied in **fixed capital**, namely, machines and structures (e.g., buildings, railways). So, without high investment in fixed capital, technically known as gross fixed capital formation (GFCF),* an economy cannot develop its productive potential very much. Thus, the **investment ratio** (GFCF/GDP) is a good indicator of its development potential. Indeed, the positive relationship between a country's investment ratio and its rate of economic growth is one of the few undisputed relationships in economics.

For the world as a whole, the investment ratio is around 20–22 per cent. But there is a huge international variation. In China, this share has stood at a staggering 45 per cent in the last few years. At the other extreme, countries like the Central African Republic or the Democratic Republic of Congo can have an investment ratio as low as 2 per cent in some years, although typically they manage around 10 per cent.

No economy has achieved 'miracle' rates of growth (that is, over 6 per cent per year in per capita terms) over a period of time without investing at least 25 per cent of GDP. At the heights of such growth, countries invest at least 30 per cent of GDP. The investment ratio went above 35 per cent in Japan in the

late 1960s and the early 1970s. During its 'miracle' growth period since the 1980s, China's investment rate has been 30 per cent and above, going above 40 per cent in the last decade.

This is not to say that a higher investment ratio is necessarily a good thing. Investment by definition sacrifices today's consumption and thus living standards, if only in the hope of achieving higher consumption in the future. So there can be such a thing as too much investment, even though how much is too much would depend on how much you value your future income against today's income (this is known as *time preference*). Nevertheless, the investment ratio – and its evolution over time – is the best single indicator of how a country is developing its productive capabilities and thus its economy.

The R&D figure is a good indicator for the richer countries

Another simple but instructive indicator of a country's economic development, especially for countries at higher levels of income, is its R&D spending as a ratio of GDP – and its evolution over time.[5]

Rich countries spend a much higher proportion of their GDP on R&D than do poorer countries. The OECD average is 2.3 per cent, with several countries spending over 3 per cent of GDP on it.* Finland and South Korea top the list. These two countries are particularly impressive in that they have increased their R&D/GDP ratio very rapidly in the last few decades and achieved impressive progress in high-technology industries.

Most developing countries do practically no R&D. The ratio is 0.1 per cent in Indonesia, 0.2 per cent in Colombia and 0.5 per cent in Kenya. China's stood at 1.5 per cent in 2009 but has been on a fast rising trend, suggesting that the country is rapidly building up its capabilities to generate new technologies.[6]

Industrialization and Deindustrialization

In theory, we can achieve economic development by enhancing our productive capabilities in any economic activity, including agriculture and services. In practice, in the vast majority of cases, economic development has been achieved through industrialization, or, more precisely, the development of the manufacturing sector.† Albert Einstein was definitely right in saying: 'In theory, theory and practice are the same. In practice, they are not.'

Mechanization and chemical processes make it easier to raise productivity in manufacturing

Raising productivity is much easier in manufacturing than in other economic activities, such as agriculture and services. Manufacturing activities are much less bound by nature and lend themselves much more easily to mechanization and chemical processing.

Agricultural productivity is very dependent on the physical environment, such as land mass, climate and soil. It is also very time-bound. Impressive ways to overcome all these natural constraints have been developed, such as irrigation, selective breeding and even genetic engineering, but there is a clear limit to them. No one has developed a way to grow wheat in six minutes instead of six months, which is roughly what should have happened, had the productivity in the wheat industry developed as fast as in pin-making over the last two and a half centuries.

By their very nature, many service activities are inherently impervious to increases in productivity. In some cases, the very increase in productivity will destroy the product itself; a string quartet cannot treble its productivity by trotting through a twenty-seven-minute piece in nine minutes. For some other services, the apparently higher productivity may be due to the debasement of the product. A lot of the increases in

retail service productivity in countries like the US and the UK have been bought by lowering the quality of the retail service itself – fewer shop assistants, longer drives to the supermarket, lengthier waits for deliveries and so on. The 2008 global financial crisis has revealed that much of the recent productivity growth in finance had been achieved through the debasement of the products – that is, the creation of overly complex, riskier and even fraudulent products.

The 'learning centre' of the economy

The manufacturing sector has been the 'learning centre' of capitalism. By supplying **capital goods** (e.g., machines, transport equipment), it has spread higher productive capabilities to other sectors of the economy, whether they are other manufacturing activities producing **consumer goods** (e.g., washing machines, breakfast cereals), agriculture or services.

Many of the organizational innovations in the manufacturing sector have been transferred to the other sectors, especially to the service sector, and raised their productivities. Fast food restaurants, such as McDonald's, use 'factory' techniques, turning cooking into an assembly job. Some even deliver food on a conveyor belt, as in kaiten-zushi restaurants (for people living in Britain, that's Yo! Sushi). Large retail chains – be they supermarkets, clothes shop chains or online retailers – apply modern inventory management techniques developed in the manufacturing sector.

Even in the agricultural sector, productivity has been raised in some countries, such as the Netherlands (which is the third-largest exporter of agriculture in the world, after the US and France), through the application of manufacturing-style organizational knowledge, such as computer-controlled feeding.

The rise of the post-industrial society?

It has recently become fashionable to argue that the manufacturing sector does not matter very much any more, as we have entered the era of **post-industrial society**.

In the early days of industrialization, many assumed that the manufacturing sector would keep growing. And for a long time, it looked to be the case. The share of manufacturing both in output and in employment was almost constantly rising in most countries. However, from the 1960s, some countries started experiencing **deindustrialization** – a fall in the share of manufacturing, and a corresponding rise in the share of services, in both output and employment. This prompted the talk of a post-industrial society. Many economists have argued that, with rising income, we begin to demand services, such as eating out and foreign holidays, relatively more than we demand manufactured goods. The resulting fall in the relative demand for manufacturing leads to a shrinking role for manufacturing, reflected in lower output and employment shares.

This view got a boost in the 1990s, with the invention of the worldwide web and the alleged rise of the 'knowledge economy'. Many argued that the ability to produce knowledge, rather than things, was now critical, and high-value knowledge-based services, such as finance and management consulting, would become the leading sectors in the rich countries that were experiencing deindustrialization. The manufacturing industry – or the 'bricks and mortar' industry – was viewed as second-rate activity that could be shifted to cheap-labour developing countries, such as China.

More recently, even some developing countries have bought into the discourse of the post-industrial economy. They have started believing that, with the rise of the post-industrial economy, they can more or less skip industrialization and become rich through services. They look to India, which is supposed to have become – through its success in the export of services like software, accountancy and the reading of

medical scanning images – 'the office of the world' to China's 'workshop of the world' (a title which had originally been conferred on Britain after its Industrial Revolution).

Deindustrialization doesn't mean that we are producing fewer manufactured products

While many people, including key policy-makers, have been seduced by it, the discourse of post-industrial society is highly misleading. Most rich countries have indeed become 'post-industrial' or 'deindustrialized' in terms of employment; a decreasing proportion of the labour force in these countries is working in factories, as opposed to shops and offices. In most, although not all, countries this has been accompanied by a fall in the share of manufacturing in output.

But this does not necessarily mean that those countries are producing fewer manufactured goods in absolute terms. Much of this apparent fall is due to the decline in the prices of manufactured goods, compared to the prices of services. This is thanks to the faster productivity growth in their production. Just think how computers and mobile phones have become cheaper (holding the quality constant), compared with the costs of haircuts or eating out. When this relative price effect is taken into account and the shares of different sectors are recalculated in **constant prices** (that is, applying the prices of the starting year to the quantities produced in subsequent years), as opposed to **current prices** (today's prices), the share of manufacturing has not fallen very much in most rich countries. It has even risen in several countries, as I will show later.

Some deindustrialization is due to 'optical illusions'

The extent of deindustrialization has also been exaggerated due to the 'optical illusions' created by the way in which statistics are compiled. A lot of services that used to be provided in-house in manufacturing firms (e.g., catering, security guards, some design and engineering activities) are now **outsourced**, that is, supplied by independent companies (at home or abroad; in the latter case this is called **off-shoring**). This gives the illusion that services have become more important than they actually have. These outsourced services are still the same activities. But they are now counted as part of service output, rather than of manufacturing output.

In addition, seeing the share of manufacturing in their output falling, some manufacturing firms have applied to be reclassified as service firms, even though they still conduct some manufacturing. A UK government report estimates that up to 10 per cent of the fall in manufacturing employment between 1998 and 2006 in the UK may be due to this 'reclassification effect'.[7]

Making things still matters

The view that the world has now entered a new era of the 'knowledge economy', in which making things does not confer much value, is based upon a fundamental misreading of history. We have *always* lived in a knowledge economy. It has always been the quality of knowledge involved, rather than the physical nature of the things produced (that is, whether they are physical goods or intangible services), that has made the more industrialized countries richer. This point can be seen more clearly if you recall that woollen manufacturing, which used to be one of the most hi-tech sectors until the eighteenth century, is now one of the lower-tech sectors. In this regard, it is useful to remember that 'There are no condemned sectors; there are only outmoded technologies,' as a French minister of industry once eloquently put it.[8]

Recently, some service activities, such as finance and transport, have experienced high productivity growths, which have caused many people to say that countries can generate economic development on the

basis of such service activities. Like Britain, they can export high-value services and use the earnings from them to buy necessary manufactured products from abroad. This strategy may be viable for a period. In the decade or so up to the 2008 financial crisis, Britain indeed managed to generate a decent rate of growth despite a rapid process of deindustrialization, thanks to a booming financial industry. But the 2008 crisis was a rude reminder that a lot of this faith in services as the new engine of growth has been illusory.

Moreover, many of these high-productivity services are 'producer services', such as engineering, design and management consulting, for which the main customers are manufacturing firms. So, a weakening manufacturing base will eventually lead to a decline in the quality of those services, which will make their export more difficult.

REAL-LIFE NUMBERS

Agriculture is still surprisingly important

Until the late nineteenth century, agriculture was the mainstay of the economy in almost all countries.[9] Even in many of today's rich countries, nearly three-quarters of people worked in agriculture until a few generations ago. In 1870, 72 per cent of the workforce was employed in agriculture in Sweden. The corresponding figure was 73 per cent in Japan in 1885.

Being a lower productivity sector than manufacturing or services, agriculture has rarely accounted for more than half of output, even when most of the people were working there. In 1870, agriculture accounted for 50 per cent of output in Denmark and 47 per cent in Sweden. South Korea's agriculture accounted for 47 per cent of output until as late as 1953.

Today, agriculture plays a very small role, in terms of both output and employment, in the rich countries. Only 1–2 per cent of their GDP is produced in agriculture, while only 2–3 per cent of people work there. This has been possible because agricultural productivity in those countries has risen enormously in the last century or so. The fact that the US, France and the Netherlands – and not some large developing economies, such as India or Indonesia – are the three largest exporters of agriculture in the world is a testimony to the height of agricultural productivity in the rich countries.

In many poorer developing countries, agriculture is still very important. In a handful of poorest countries, more than half the output is still produced in agriculture.* Even in the richer developing countries, agriculture still accounts for 20–40 per cent of output.

Agriculture plays an even more important role when it comes to employment. It employs 80–90 per cent of people in some of the poorest countries, such as Burundi (92 per cent), Burkina Faso (85 per cent) and Ethiopia (79 per cent). Despite the country's impressive industrialization in the last three decades, 37 per cent of people in China still work in agriculture.

Manufacturing in the rich countries is less important than before …

At their peaks (between the 1950s and the 1970s, depending on the country), nearly 40 per cent of the workforce in the then industrialized countries of Western Europe and the US worked in the manufacturing sector. The number reached nearly 50 per cent if you looked at industry as a whole.

Today, in most rich countries, less than 15 per cent of people work in manufacturing. Exceptions are countries such as Taiwan, Slovenia and Germany, where upwards of 20 per cent are still employed in

manufacturing.* In some of them, such as the UK, the Netherlands, the US and Canada, the corresponding number is only around 9–10 per cent.

The fall in employment share of manufacturing has been accompanied by a fall in output share. In some countries, such as Austria, Finland and Japan, the share of manufacturing in GDP used to be around 25 per cent until the 1970s. Today, in none of the richest countries does it account for more than 20 per cent.[10]

…But it is still far more important than people think it is

I have explained above that much of the apparent decline in the share of manufacturing in GDP is due to the faster productivity growth in manufacturing, which makes manufacturing products relatively cheaper compared to other things (services and agricultural products). This means that the share of manufacturing can be very different, depending on whether it is calculated in constant prices (to remind you, the prices at the beginning of the period we are looking at) or current prices.

During the last two decades, in some rich countries, such as Germany, Italy and France, the fall in the share of manufacturing in GDP has been quite large in current prices (by 20 per cent in Germany, 30 per cent in Italy and 40 per cent in France), but not been so large in constant prices (by less than 10 per cent in all three).[11] In several rich countries, the share of manufacturing has actually risen, if calculated in constant prices: in the US and Switzerland, its share has risen by around 5 per cent in the last couple of decades;[12] in Finland and Sweden, the share has actually risen by as much as 50 per cent over the last few decades.[13]

An important exception is the UK, in which the share of manufacturing has fallen dramatically in the last couple of decades, even in constant prices.[14] This suggests that the UK's deindustrialization has largely been the result of the absolute decline of its manufacturing industry due to loss of competitiveness, rather than the relative price effect due to differential productivity growth rates.

'Premature' deindustrialization in developing countries

In the last three decades, many developing countries have experienced 'premature' deindustrialization. That is, the share of manufacturing (and industry in general) in their outputs and employments started falling at a much earlier stage of economic development than had been the case for the rich countries.

Latin America's share of manufacturing in GDP rose from 25 per cent in the mid-1960s to 27 per cent in the late 1980s but has fallen dramatically since then. It stands at only 17 per cent today. In Brazil, the industrial powerhouse of the continent, deindustrialization has been even more dramatic. The share of manufacturing in GDP has fallen from 34 per cent in the mid-1980s to 15 per cent today. In Sub-Saharan Africa, the share has fallen from 17–18 per cent during the 1970s and much of the 1980s to 12 per cent today.[15]

This premature deindustrialization is largely the result of neo-liberal economic policies implemented in these countries since the 1980s (see Chapter 3).[16] Sudden trade liberalization has destroyed swathes of manufacturing industries in those countries. Financial liberalization has allowed banks to redirect their loans to (more lucrative) consumers, away from producers. Policies geared towards inflation control, such as high interest rates and over-valued currencies, have added to the agony of manufacturing firms by making loans expensive and exports more difficult.

Service-based success stories?: Switzerland, Singapore and India

When talking about the post-industrial economy, people frequently cite Switzerland and Singapore as the examples of service-based success stories. Haven't these two countries shown, they say, that you can become rich – very rich – through services such as finance, tourism and trading?

Actually these two countries show the exact opposite. According to the UNIDO data, in 2002, Switzerland had the highest per capita manufacturing value added (MVA) in the world – 24 per cent more than that of Japan. In 2005, it ranked the second, after Japan. Singapore ranked the third in that year. In 2010, Singapore ranked the first, producing 48 per cent more MVA per capita than the US. Switzerland ranked the third, after Japan. Switzerland produced 30 per cent more MVA than the US in that year.

As for the claim that India has shown how countries can skip industrialization and achieve prosperity through services, it is very much exaggerated. Before 2004, India had a **trade deficit** in services (namely, it imported more services than it exported). Between 2004 and 2011, it did run **a trade surplus** (opposite of trade deficit) in services, but that was equivalent only to 0.9 per cent of GDP, covering only 17 per cent of its trade deficit in goods (5.1 per cent of GDP). It is hardly a service-based success story.

Running Out of the Planet?: Taking Environmental Sustainability Seriously

We need to take environmental constraints extremely seriously

Before we leave the world of production, we must address the looming question of the environmental limits to economic growth. There is no doubt that climate change, mainly caused by our material production and consumption activities, threatens human existence. Moreover, many non-renewable resources (such as oil and minerals) are rapidly being depleted. Even the earth's capacity to produce renewable resources, such as agricultural products or forestry products, may be outpaced by the increase in demand for those resources. Given all of this, we are going to run out of the planet, so to speak, if we do not find ways to control the impacts of our economic activities on the environment.

But doesn't this mean that we should stop economic development, which I have defined as the increase in our capabilities to produce? If so, doesn't that negate a lot of things I have said so far in the chapter?

Technological developments can be solutions, as well as causes, of environmental problems …

It must have been 1975 or 1976, as I think I was twelve or thirteen. I came across this book, *The Limits to Growth*, by a curiously named author, the Club of Rome. Flicking through the book, even though I couldn't fully understand it, I became very depressed. It said that the world will run out of oil in 1992 or thereabouts. So, even before I turn thirty, I thought, I am supposed to start riding around in bullock carts and burn wood for heating? That seemed mightily unfair, especially when my family had moved to a house with oil-burning central heating system only five or six years earlier.

The prediction by the Club turned out to be right. We *have* run out of oil – that is, the oil that was accessible with the technologies of the 1970s. But we are still burning oil in huge quantities because we have become much more efficient in locating and extracting oil from places that were just not accessible forty years ago, especially the deep sea.

Technology does not only give us access to formerly inaccessible resources but it expands the definition of what is a resource. Sea wave, formerly only a destructive force to be overcome, has become a major energy resource, thanks to technological development. Coltan used to be a rare mineral of relatively little value until the 1980s. Today, it is one of the most valuable minerals in the world – to the

extent that many rebel groups in the Democratic Republic of Congo are said to finance their wars with slave labour in coltan mines. Tantalum, one of the component elements of coltan, is a key ingredient in the making of parts used for mobile phones and other electronic goods.

At a less dramatic level, technological development allows us to produce renewable resources with greater efficiency. As I pointed out earlier in the chapter, over the last century, humanity's ability to produce food – and other natural raw materials (e.g., cotton) – has been enormously increased by mechanization, use of chemicals, selective breeding and genetic engineering. We have also become more efficient in the use of given resources. Car and aircraft engines and power stations use less oil and coal to get the same amount of energy. We recycle an increasingly higher proportion of our materials.

… but there are limits to technological solutions

However fast our technologies develop, there are still definite limits to the availability of non-renewable resources, even including those natural substances that are yet to become resources.

We won't completely run out of any of the major resources in the near future. But their declining availability can make them unaffordable to poorer people, threatening their welfare or even existence. The rising price of water is already hurting poor people by increasing waterborne diseases and reducing their agricultural yields. Higher food prices would increase hunger and malnutrition. More expensive fuel would cause extra deaths of poor elderly people in winter even in the rich countries. As in the world of Neal Stephenson's science-fiction novel *The Diamond Age*, poor people may be forced to cope with flimsy synthetic substitutes made with nano-technology, rather than real natural materials.

Far more urgent, of course, is the challenge of climate change, whose consequences are already being felt and certain to become extremely serious, if not necessarily catastrophic, within the next generation or two. And given this, it is extremely unlikely, if not logically impossible, that humanity will be able to come up with a purely technological solution to climate change in time that does not require any significant change in the way in which we live.

Developing countries still need more economic development in order to raise their living standards and to better adapt to climate change

All of this does not mean that we need to stop economic development, especially for developing countries. To begin with, developing countries still need more output – that is, economic growth – provided that it is not totally appropriated by a tiny minority. Higher income for these countries doesn't just mean another TV but working in less back-breaking and dangerous conditions, not having to see your children die as babies, living longer, falling ill less often and so on. Such changes would be more sustainable if they came from economic development (that is, increase in their productive capabilities) rather than simple growth, but even growth coming from a resource bonanza would be valuable for these countries.

Developing countries also need to increase their productive capabilities to be able to deal with the consequences of climate change (**climate adaptation** is the technical term). Due to their climate, locations and geography, many developing countries are going to bear the brunt of the impacts of global warming, despite having very little, if not necessarily minimal, responsibility for causing it. Despite this, these are exactly the countries with the least capability to deal with those impacts.* In order to better deal with the consequences of climate change, poor countries need to equip themselves with better technologies and organizational capabilities, which can only be acquired through economic development.

The case for having more economic growth and development in the least-developed countries is overwhelming, as growing their income to a certain level (say, where China is today) would make at most a marginal difference to climate change, as, for example, discussed in the Greenhouse Development Rights (GDR) framework, developed by two think tanks, Eco-Equity and the Stockholm Environmental Institute.[17]

Rich countries should continue to develop their economies but radically change their production and consumption priorities

Given that they are already consuming the vast bulk of the world's resources and they have far fewer needs to increase consumption, the rich countries need to reduce their consumption, if we are to dampen the extent of climate change. But even with lower aggregate consumption, human welfare need not go down. In highly unequal countries like the US, Britain and Portugal, reduction in inequality will allow more consumption for more people. Even in relatively equal societies, welfare can be increased without increase in consumption by consuming differently, rather than consuming more.[18] Increase in the consumption of collective services, especially public transport and leisure facilities, can improve welfare by reducing the resources wasted in fragmented individualistic consumption: time wasted in sitting in a car in a traffic jam or duplication of services between small private libraries that are popular in countries like Korea.

In addition to reducing the amount of consumption, its energy intensity can be reduced. Stricter energy efficiency requirements on buildings, cars and electrical equipment may be imposed. Out-of-town shopping centres and suburban developments could be discouraged, while investments in better public transport are made, so that people drive less. Cultural shifts may also be needed if people are to find more joy in having quality time with family and friends than buying things. Continued, or even increased, use of nuclear power should be contemplated outside major earthquake areas (such as Japan, parts of the US and Chile) as a transitional measure before we completely shift to renewable energy sources.[19]

But all of this does *not* mean that the rich countries should stop economic development, at least in the sense in which I have defined it in this chapter. They can still increase their productive capabilities but use them not to increase material consumption but to reduce working hours while producing the same amount as, or even more than, before. They can develop – and transfer to developing countries at affordable prices – their productive capabilities in activities that combat climate change and other environmental problems, such as better renewable energy technologies, more efficient but environmentally friendly agriculture and more affordable desalination technology.

Concluding Remarks: Why We Need to Pay More Attention to Production

Production has been seriously neglected in the mainstream of economics, which is dominated by the Neoclassical school. For most economists, economics ends at the factory gate (or increasingly the entrance of an office block), so to speak. The production process is treated as a predictable process, pre-determined by a 'production function', clearly specifying the amounts of capital and labour that need to be combined in order to produce a particular product.

Insofar as there is interest in production, it is at the most aggregate level – that of the growth in the size of the economy. The most famous refrain along this line, coming from the debate on US competitiveness in the 1980s, is that it does *not* matter whether a country produces potato chips or micro-chips. There is

little recognition that different types of economic activity may bring different outcomes – not just in terms of how much they produce but more importantly in terms of how they affect the development of the country's ability to produce, or productive capabilities. And in terms of the latter effect, the importance of the manufacturing sector cannot be over-emphasized, as it has been the main source of new technological and organizational capabilities over the last two centuries.

Unfortunately, with the rise of the discourse of post-industrial society in the realm of ideas and the increasing dominance of the financial sector in the real world, indifference to manufacturing has positively turned into contempt. Manufacturing, it is often argued, is, in the new 'knowledge economy', a low-grade activity that only low-wage developing countries do.

But factories are where the modern world has been made, so to speak, and will keep being remade. Moreover, even in our supposed post-industrial world, services, the supposed new economic engine, cannot thrive without a vibrant manufacturing sector. The fact that Switzerland and Singapore, which many people consider to be the ultimate examples of successful service-led prosperity, are actually two of the three most industrialized countries in the world (together with Japan) is a testimony to this.

Contrary to conventional wisdom, development of productive capabilities, especially in the manufacturing sector, is crucial if we are to deal with the greatest challenge of our time – climate change. In addition to changing their consumption patterns, the rich countries need to further develop their productive capabilities in the area of green technologies. Even just to cope with the adverse consequences of climate change, developing countries need to further develop technological and organizational capabilities, many of which can only be acquired through industrialization.

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