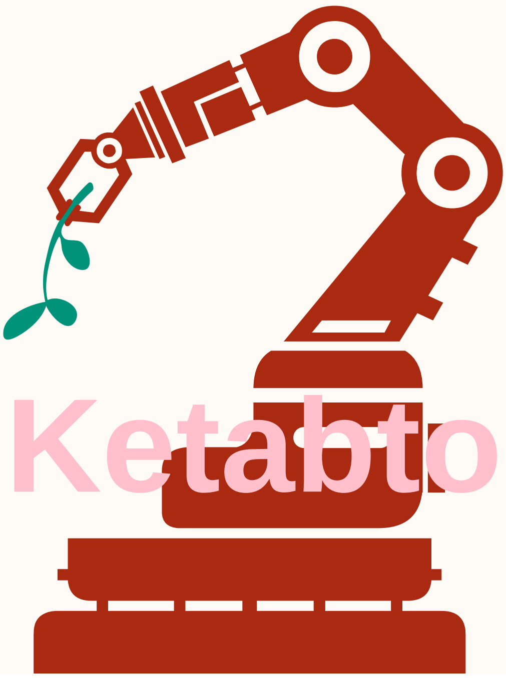
Murat A. Yülek

HOW NATIONS SUCCEED

MANUFACTURING, TRADE, INDUSTRIAL POLICY, & ECONOMIC DEVELOPMENT



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palgrave
macmillan

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ISBN 978-981-13-0567-2 ISBN 978-981-13-0568-9 (eBook)
https://doi.org/10.1007/978-981-13-0568-9

Library of Congress Control Number: 2018947747

Cover illustration: © grimgram / Getty Images
Cover design by Tom Howey

Printed on acid-free paper

This Palgrave Macmillan imprint is published by the registered company Springer Nature Singapore Pte Ltd.
The registered company address is: 152 Beach Road, #21-01/04 Gateway East, Singapore 189721, Singapore

To my father, who instilled in me the importance of manufacturing,
and to my mother, who epitomized hard work, dedication, and selflessness

A Note on Conventions Used

[ ] brackets indicate the author's additions to the text quoted from other sources.

Names with year(s) in parenthesis refer to a written work of that person.

" " are used when sentences from other sources are directly quoted.

' ' are used for emphasis.

Dutch states, United Provinces, and the Netherlands have been used interchangeably for practical purposes.

British and English, and Britain, Great Britain, and UK have been used interchangeably for practical purposes.

Acknowledgements

I owe gratitude to many people who directly or indirectly contributed to this book. To name but a few of them: Gülten and Ziya Altunyaldız, Hissam Kamal Hassan, Franco Mosconi, Ömer Faruk Çelebi, Davut Kavranoğlu, Nobuyuki Idei, Yusuf Balcı, Ahmet Kazokoğlu, Turan Erol, Bülent Arı, Hongyul Han, Mustafa Erdoğdu, Kwon Hyung Lee, Ali Akkemik, Sadık Ünay, Nurullah Gür, Ahmet Faruk Aysan, Mehmet Hüseyin Bilgin, Murat Makaracı, Sübidey Togan, Arif Ergin, Orkun Hasekioğlu, Orhan Aydın, Ahmet Yücel, Mustafa Özel, Ha Joon Chang, İhsan Elhan, Kaoru Natsuda, Hüseyin Arslan, Piergiuseppe Fortunato, Halil Şener, Zübeyde Çağlayan-Kın, Bilge Turhan, Cengiz Alacaçı, Gabriel Bezchinsky, Mario Cimoli, Sandrine Labory, Nurullah Gür, Ömer Fatih İrdam, Ömer Faruk Kodalak, Hüseyin Güler, Kunrat Wirasubrata, Murat Yalçıntaş, Michael Peneder, Melikşah Utku, Travis Taylor, Diana Barrowclough, Mohammad Yousef, Alpaslan Girayalp, Alan Deardorff, Mehmet Turşak, Bilal Tek, Hacı Ali Özen, Çağatay Emrah Öngüt, and Abdülkadir Karakelle. I have benefited from the works of science historian Fuat Sezgin and from discussions with the late James Tobin. Special thanks to Lorna Girayalp for editing; Hissam Kamal Hassan, Peter Klempner, and Shirley Lambert also assisted with editing parts of the book. Ibrahim Altuncu helped with the cover design. I am also grateful to Selçuk Dinç, Cansu Saraç, Mustafa Reşit Bulut, and Kadriye Baş for their editorial, graphics, and data assistance.

I have benefited from participation and presentations in conferences and symposia such as Trade and Sustainable Development Symposium (TSDS), as well as my from residence, consultancy tenures, and presentations at various institutions, including United Nations Conference on Trade and Development (UNCTAD), Scientific and Technological Research Council of Turkey (TÜBİTAK), APU Ritsumeikan University, Istanbul Commerce University, Yale University, Georgetown University, Korea Institute for International Economic Policy (KIEP), Ankara Center for Thought and Research (ADAM), Universitá degli Studi di Parma, and the European Investment Bank.

Contents

Abbreviations

AC	Absorptive Capacity
AE	Architectural Engineering (nuclear plants)
CNEPP (Korea)	Comprehensive Nuclear Energy Promotion Plan
DbPP	Development-based Public Procurement
EVAP	Economic Value-Added Potential
GDP	Gross Domestic Product
HCI Drive	Heavy and Chemical Industries Drive
KHIC (Korea)	Korea Heavy Industry and Construction
KSNPP	Korean Standard Nuclear Power Plant
LbD	Learning by Doing
LbI	Learning by Imitation
LbRD	Learning by R&D
Li	Linkages
LNPP (Korea)	Long-Term Nuclear Power Promotion
MLP (Korea)	Machinery Localization Policy
MP	Market Potential
MPTL (Korea)	Master Plan for Technological Localization of Nuclear Power Plants
NSSS	Nuclear Steam Supply System
PWR	Pressurized Water Reactor
RDC	R&D capability
SFL	Shop-Floor Learning

STI Policies	Science, Technology, and Innovation Policies
TC	Technological Capability
TT	Technology Transfer
VGR	Value Generation Rate
VOC	Vereenigde Oost-Indische Compagnie

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Prologue

This book is about a simple but powerful argument and a similar observation. The argument is that industrialization is a good thing economically, but it involves a costly, risky, and complex process. Many confuse industrialization with the construction of many factories. In fact, it is a capacity-building process with a significant intangible aspect; more than hardware, industrialization resembles software. It goes through certain stages and many countries of the world have not been able to proceed to advanced stages. However, as the country progresses towards advanced stages, the economic returns it reaps from industrialization increase.

The observation is that successful industrialization in the modern era has nowhere and never been an accident. It has always been based on some policy that aimed at supporting manufacturing. Currently, we call these 'industrial policies.' Has industrial policy been really effective, has it been efficient; has it been the sole driver of successful industrialization, and could better policies have been employed? Although these are all relevant and important questions, the observation remains.

Few fully realize that industrialization is a crucial necessity for economic development and requires design and implementation of appropriate policies. Many countries ignore industrial policy or fail to employ it effectively. The outcome is that countries such as Japan, South Korea, Germany, Sweden, China, and Finland stand out as rare relatively recent examples of successful economic development on the back of industrialization. Meanwhile, the majority of countries remain in the middle-income trap, or—if we may call it so—the low-income trap.

Industrial policy is used to change the production structure of an economy in favour of the manufacturing industry by channelling a government's selected budgetary and non-budgetary resources and by channelling private capital, labour, and entrepreneurs towards the manufacturing sector. Industrial policy, as other 'structural policies,' is designed and implemented in order to improve the long-term growth performance of the economy. In particular, it helps countries surmount the so-called middle-income trap by raising growth performance over the long term. This is made possible by the innovational and growth-inducing nature of the manufacturing sector, as Cambridge economist Kaldor has suggested.

This book is in three parts. The first part is historical and selectively discusses important factual aspects of how some of today's major industrialized countries were industrialized.

In the UK, the Industrial Revolution began in the eighteenth century. It was not an accident; what can be identified as industrial policies had started much earlier. It started at a time when the UK was characterized as a mercantilist, colonizing, hegemonizing, and brutal empire built after the fifteenth century. The Spanish and Portuguese empires preceded Britain with their versions of mercantile, brutal, and hegemonizing histories. However, they could not industrialize, as they ultimately failed to employ industrial policies. They started the twentieth century as poor countries, although they had reaped a significant amount of gold and silver from South America in previous centuries, as their governance remained extractive and pillaging in spirit, much as Mittereuer (2010: 225) attributes to the Pisans and Genoese of the eleventh century.

Britain started to employ policies to achieve industrialization as early as the fourteenth century through import–substitution-type industrial policies. After it built its global empire, its industrial policies aimed at keeping its colonies as suppliers of raw materials (at prices commanded by the British) and the mainland as a manufacturing hub: navigation acts, restricting manufacturing activities in the colonies through its colonial laws, enforcing triangular trade arrangements that gained Britain a monopoly power over its international trade and opening up new markets for its industrial export apparatus by forcing the ('unequal' as East Asians called it) free trade agreements with unprepared and politically and militarily weak markets (such as China). The outcome for Britain was impressive; it indeed became the manufacturing and commercial hub of the world; it collected raw materials at low prices from around the world and disseminated its manufactured products to its colonies and other markets.

Today's industrialized nations which experienced their industrial revolutions after the British have all employed industrial policies at different times in their development cycles. This is confirmed by the stories of France, the USA, Japan, Germany, and Russia. In each of them, one or more dominant leaders pushed for economic (and social) reform and industrialization. They did it for the country to become powerful both militarily and politically. Industrialization has thus been used as a tool for military and political power.

Part II of the book discusses manufacturing and trade balance. It sets out to answer some basic questions. Why manufacturing? Is there anything special about manufacturing? Is manufacturing a poor man's business? Who manufactures in the world and who exports what? Among other things, Part II argues that manufacturing is the hotbed of productivity, and innovations and services are the hotbed of employment.

In our world today, global imbalances are more crucial than ever. They are driven by the major trade deficits of some countries and surpluses of others. A trade surplus of a country drives growth and employment. That 'export-led growth' explains growth in countries such as Germany, South Korea, Japan, and China; without trade surpluses, these countries would have had lower growth rates. On the other hand, trade deficits, in particular caused by 'unnecessary' imports, mean less growth and more unemployment for the importing country than would otherwise occur. As manufacturing constitutes the major part of world exports and imports, the manufacturing sector, then, is vital for growth and overall employment.

Part III discusses industrial policy. It starts by introducing a stylized process of industrialization that helps determine at what stage of industrialization a country is. Overall, industrialization is a capacity-building process that materializes through real manufacturing experience over time. It requires the development of human and institutional skills.

It is important to stress that not all manufacturing makes money for the manufacturer. The *smile curve* implies that some manufacturing forms may yield peanuts for the firm and country. However, manufacturing always has positive side effects through linkages to other industries and through learning effects that generate larger impacts on society than on the individual manufacturing firm.

If industrialization is not an accident, then it should be enabled by policy. In this case, what kind of policy and who makes the policy? Strategic sectors? How does one identify them? How does one sequence science, technology, and innovation (STI) policies with industrial policy. These are discussed in Part III also. Sectors are often qualified as 'strategic,' but from an economic point of view, there is no consensus let alone an analytical study on what makes a sector 'strategic.' On the other hand, East Asian success in industrialization is often attributed to 'picking the winners,' which implies they must have selected 'strategic' sectors such as electronics, shipbuilding, or automotive. This part of the book proposes an analytical framework for defining and ranking strategic sectors.

Industrialization is possible through the industrial layer of industrial firms and entrepreneurs, industrial labour and managers, and industrial finance. Industrial policy is designed and implemented by the state on the industrial layer. It is the capacities of the state and the industrial layer that are the key to a successful industrial policy.

PART I

Industrialization Was Never an Accident: Colonialization, Monopolized Trade, and Industrialization

> "If you would understand anything, observe its beginning and its development."
>
> —Aristotle

On 16 August 1838, a free trade agreement between the Ottoman Empire and Great Britain was signed in Istanbul. The treaty opened up the Ottoman domestic market to the attractive manufactured products of newly industrialized Great Britain. Soon after, the coverage of the agreement was extended to other industrialized nations, including France, the Netherlands, and Belgium.

The agreement also secured Ottoman exports of raw materials needed by Britain and other industrialized nations of Europe. As the Ottoman Empire was not as industrialized as much of Europe at the time, Ottomans could offer cotton, tobacco, grapes, copper, iron, and similar goods to rapidly growing European industries desperately in need of increasing amounts of raw materials. Previously, Ottoman economic policy was based on the notion of *provisionism*, which meant that the people would have abundant access to goods; in other words, Ottoman policies did not encourage exports.

At the time of the free trade agreement, industrial manufacturers in Great Britain and other industrialized nations had several important competitive advantages compared to their rivals (or rather artisans) in the Ottoman Empire, which had not yet gone through an industrial revolution.

Firstly, due to the higher scale of production, unit costs of production in Britain were lower than in the Ottoman Empire. Secondly, British end-products and their packing designs were now more appealing than Ottoman ones, which looked more traditional in both content and package. Thus, European products commanded adoration from consumers, as they do in many underdeveloped countries today. Consumers considered buying products with the European 'nation brand' to be a status symbol. Thirdly, European companies manufactured certain products that simply did not exist in the Ottoman Empire at the time.

Under the free trade agreement, Ottoman producers faced unprecedented competition from more advanced and prepared rivals. This led to the demise of the traditional production pattern and prevented private ventures from establishing modern industrial facilities. The main reason for this was that the traditional, low-scale, and mostly manual manufacturers of the unindustrialized Ottoman Empire were not ready for competition with the modern manufacturers of industrialized Great Britain. As expected, many Ottoman manufacturers (e.g. of textiles) went out of business after the Agreement came into force. Any hope of the transformation of the pre-industrial Ottoman production pattern into the modern one effectively vanished. The Agreement also made competition with international rivals more difficult, as, while it abolished import duties, taxes on the transport and sale of domestically produced goods remained intact. Moreover, the Ottoman budget lost import tax revenues.

* * *

The above is a synopsis of the Ottoman experience of being forced to open up to international trade with the major exporters of the time such as Great Britain. It was not much different from an ordinary man being forced into a boxing match with a well-trained professional heavyweight boxer. However, the Ottoman Empire, which soon dissolved, was not alone in this experience in the second half of the nineteenth century. It was a common experience for many poorer countries of the world at the time.

What Ottoman officials also did not know was that the text of the Agreement they signed came from a standardized contract. Great Britain and other nations forced more or less the same free trade agreement texts on many countries in Asia and Latin America. Many of these agreements were signed unwillingly, and under military pressure from these stronger nations under the so-called gunboat diplomacy of the nineteenth century.

That was why the Chinese and then the Japanese and Koreans called them the unfair treaties. In Africa, there was no need for free trade agreements, as the colonizers directly ruled the African territories.

How did the world end up there in the nineteenth century? How did the colonizers, especially Great Britain, expand their territories around the globe? Was industrialization an accident in these countries? What contribution did the possession of global territories made on Britain's industrialization and vice-versa? The first part of the book deals with these questions.

CHAPTER 1

The Old World Order: Trade Before the Empires on which the Sun Never Set

The global colonial expansion of Spain, Portugal, the Netherlands, France, and Britain after the fifteenth century was a completely new phenomenon for the world. Unlike ancient colonization experiences, such as that of the Romans or Phoenicians, or major waves of migration or occupation, this episode of colonization engulfed the entire globe and made some nations much more powerful and richer, while leaving others poor and dominated.

How did the world end up there? How did these global colonizing empires emerge? And at what expense? This chapter reviews the process that led to the global colonial empires.

1.1 Eurasian Trade: Reverse Flows of Merchandise from Asia Versus Gold from Europe

Eurasian trade has been, and still is, the most important long-range trade in the world. Today, the trade volume of merchandise between Asia and Europe has already surpassed $1.5 trillion,[1] notwithstanding the flow of financial and direct investments. By 2016, China had accumulated international reserves of $3 trillion, made possible largely by China's trade surplus—the difference between the Chinese merchandise exports (mainly to Europe and the USA) and what its imports.

M. A. Yülek, *How Nations Succeed*,
https://doi.org/10.1007/978-981-13-0568-9_1

A well-known theory of trade, the gravity model, predicts that countries with high or growing levels of income (total income and not necessarily per capita income) and population are likely to register higher levels of inter-trade despite long distances. Moreover, complementarity in the product ranges of the two parties further enhances the volume of that trade.

Eurasian trade has clearly demonstrated the merits of the gravity model. Europe, which has a high population density, needed products from Asia (and vice versa), either because they were attractive, non-existent, and/or had lower import prices. The history has unfolded more or less in line with that theoretical account except that the differences in tastes were also a very important factor driving the direction and amount of flows.

The trade and bullion flows between Europe and Asia go back thousands of years. European consumer demand for Asian merchandise was at the centre of this trade. In the first century AD, Pliny the Elder, the Roman author of *Naturalis Historia*, who called India "the sink of the world's precious metals," famously wrote:

> India, China and the Arabian Peninsula take one hundred million sesterces [Roman silver coins] from our empire per annum at a conservative estimate: that is what our luxuries and women cost us. For what fraction of these imports is intended for sacrifices to the gods or the spirits of the dead?

On the other side of the trade was the perennial demand for gold and silver in Asia, mostly due to cultural and physical reasons. The Asians did not have much desire for the relatively primitive European merchandise. Instead, households, governments, and temples were interested in hoarding gold and silver. As the local reserves of gold and silver were small, the appetite for hoarding had to be satisfied by inflows from other parts of the world. The recently revealed treasure[2] of the Padmanabhaswamy Temple in Thiruvananthapuram at the order of 1 trillion Indian rupees (approximately $15 billion at the time) included 2000-year-old Roman coins as well as Dutch, Portuguese, and Venetian money.

Until the nineteenth century, the East must have recorded a surplus in its merchandise trade with the West; the total value of goods shipped from Asia to Europe was higher than the other way around. This trade, and consequently the 'current account' deficit, created specie flows from Europe to Asia to pay for it for hundreds of years. In turn, India, together with China has, over centuries, accumulated gold and silver, truly earning the name of the 'bullion sink' of the world.

1.2 Economics and Commerce in Medieval Europe Prior to European Geographical Explorations

In medieval times, the Mediterranean became Europe's most important arena of trade following humble beginnings. Western Europe's 'dark ages' followed the collapse of Rome in the fifth century AD at the hands of the Germanic 'barbarians,' as the Romans called them. The first few subsequent centuries were quite gloomy, with a long period of political fragmentation, conflict, feudal pressures, widespread poverty, and overall economic stagnation. The fall in agricultural productivity due to erosion, soil exhaustion, and taxation that started during the Roman Empire—and which also contributed to its collapse—continued through the early barbarian centuries. Economic stagnation and low population growth led to falling prices despite decreasing production.[3] The dismantling of the Roman administration led to a simultaneous fall in the amount and quality of public services as well as to lower taxation.

Then came a small relief in the tenth century that continued over the next four centuries, which Robert Lopez calls the 'commercial revolution of the middle ages' in Western Europe. During this period, both population and agricultural productivity increased. Rising agricultural production pushed the economy beyond subsistence, offering a surplus for intra- and intercontinental trade.

Increasing population and income, albeit slow, also expanded the demand base. Consequently, trade flourished in Western Europe, first leading to the formation of markets in and around towns—first temporary and then permanent—as well as to the *Champagne Fairs*, which peaked in twelfth and thirteenth centuries. The latter were regular commercial gatherings at different times of the year in which merchants from different parts of Western Europe travelled overland to exchange merchandise such as textiles, leather, fur, and spices. City administrations welcomed the formation of markets and fairs, as these increased economic activity and income. This expansion of continental trade earmarked the start of what historians later called the 'commercial revolution.'

1.3 The Silk Road and the Spice Route in Medieval Times: The Mediterranean as Part of Global Trade

In parallel with the domestic trade, Europe's international trade also expanded. China, India, and Central Asia produced and exported to Europe high-priced merchandise such as silk and other textiles, spices, porcelain, medicine, cotton, and later tea. One reason for the high prices was the scarcity and quality of the products. Another reason was because of the long shipping distance, risks, and high merchant profits. Non-European merchandise was transported to the western world along two distinct intercontinental routes: the so-called Silk Road and the Spice Route.

On land, the *Silk Road* (Fig. 1.1) consisted of a 7000-km network of routes starting from Chang'an (today known as Xi'an) in China and extending to Europe through Central Asia. Some extend the history of the Silk Road back to 4000 years.[4] It was the fabled road to the riches of the East that lured Marco Polo, among others. The main object of trade was silk and other fabrics. The route of Alexander the Great mirrored the Silk Road, which had been used by merchants, pilgrims, and refugees at least since the second century AD. One of Genghis Khan's main objectives was

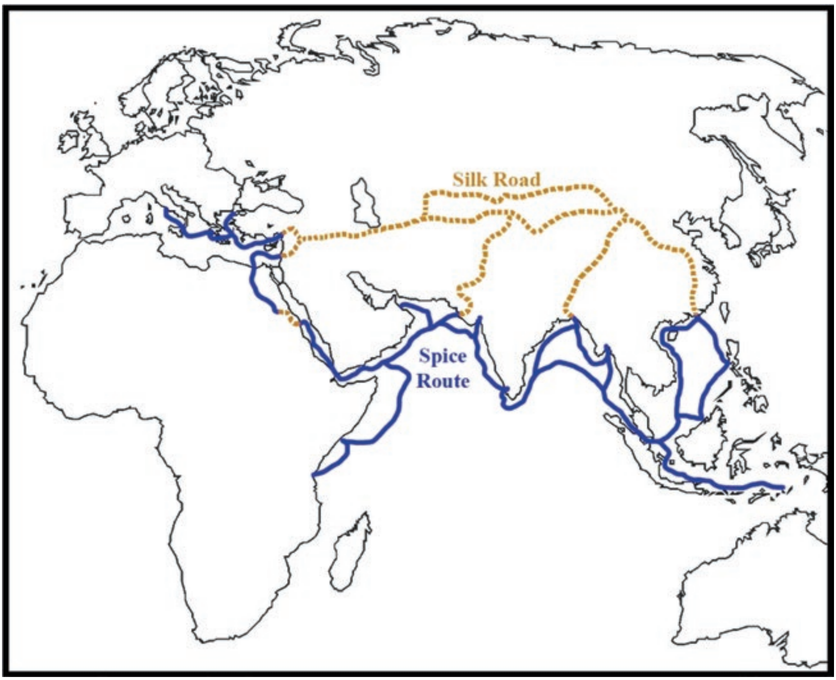

Fig. 1.1 The Silk Road and the Spice Route

to capture the Silk Road to benefit from trade revenues; he achieved it by his brutal actions. He also widened the Silk Road network by adding the Black Sea routes, and under *Pax Mongolica*, East-West trade and cultural relations expanded.

The second was the *Spice Route* (Fig. 1.1). It was also called the *Baharat Route* in languages such as Ottoman, in which *baharat* is taken to mean spices, but in fact it simply comes from the Hindu name for India, *Bharat*. The Spice Route was a network of sea and land routes joining what is today India and Indonesia to the Middle East and Europe.

After the seventh century AD, seasoned Arab and Indian seafarers carried spices (mostly received from Indonesia) from western ports of India to Egyptian or Arabian ports on the Red Sea. Caravans then carried the merchandise to today's Syria, that is, Damascus, to the east and to Alexandria to the west.

This Indian Ocean trade was an almost ideal case of free trade. Traders could choose from ports to approach and would compete with others to buy merchandise. If a port imposed duty on merchants, the latter would move on to other ports. Neither the buyers nor the sellers wielded any pricing power over the market.

Venetian ships would take the merchandise from Alexandria to Venice, the greatest *entrepôt* of Europe of the time. This trade made Venice rich during the medieval period. It would, however, be doomed by Vasco de Gama, who rounded the Cape of Good Hope in 1497 and developed the European sea routes to the Indies. Unluckily, de Gama reached India just before Egypt was incorporated into the Ottoman Empire in 1517, which together with Anatolia and Syria, granted the Ottomans a uniquely strategic position in commercial terms. The most important outlets of both the Spice Route and the Silk Road to Europe now belonged to the Ottoman Empire.

1.4 Venice Reaches the Zenith of Power in the Mediterranean

The commercial revolution of the Middle Ages had culminated in the supremacy of the Italian city-states of Venice, Milan, Genoa, and Florence, which had significant skills in production, banking, and international trade and networks. Venice and Genoa dominated the sea trade on the Mediterranean. Subsequently, in the early fourteenth century, with improved ships, their fleets also extended their sea routes to Flanders on the Atlantic Western European coast. This became an important factor in the weakening of the central position of the Champaign Fairs. Previously, it was more efficient for the Italians to send merchandise to Europe over the land routes through the Alps.[5]

In their Western European markets, Italians sold both the spices and the silk they bought from the Levantine ends of the Spice Route and Silk Road. As of the fourteenth century, the Italian territories, together with Flanders, also stood out in terms of their superior production skills in textiles. Flanders had developed its weaving industry based mostly on imported wool from England. The Italian industry, as mentioned above, relied more on Anatolian and Syrian cotton. The two could be considered the industrial powers of pre-industrial Western Europe. Italians sold their textiles produced using cotton mostly imported from Anatolia and Syria[6] and wool imported from Britain. It was no surprise that the Italian merchants and bankers were characters in Shakespeare's plays, as they were the ones who developed banking, insurance, trade norms, and bookkeeping in Europe.

Among the four Italian city-states, which were the greatest city economies in Europe except for the likes of Constantinople or Cordoba, Venice stood out as the commercial giant. From a swamp where migrants fleeing the Hun invasion settled in the sixth century AD, Venice slowly but steadily developed, especially through its sea trade with Mamluk Egypt in later centuries. Venice gained its de facto political and religious independence from the Byzantine Empire in the ninth century (as opposed to the official date of independence in the eleventh century) when the body of St. Mark was smuggled from Mamluk Alexandria, with which Venice had very close relations.[7] Hence, it became known as 'New Alexandria.'

Venetian power reached its zenith in the fifteenth century. As the foremost entrepôt that transported Asian spices and silk to Western European markets, by 1423, it possessed the largest commercial fleet in Europe.[8] It ruled many cities and ports on the Mediterranean coast and developed a significant textile and fashion industry.[9] Venice was Europe's 'Gate to the East.'[10] If population growth is a measure of economic and political power, or opportunities, then the rapid population growth of Venice—three times the population of London by the fourteenth century—demonstrates this interaction (Table 1.1).

While in the fifteenth century, the four Italian city-states became the centre stage of the Western European economy, countries and regions in the fragmented western periphery of the continent suffered from being cut out from the show. They also lacked industries to manufacture tradable merchandise. Today's Portugal, Spain, Southern France, and Great

Table 1.1 Population of selected large cities in Western Europe

	1050	*1200*	*1330*	*1500*
Cordoba	450,000	60,000	60,000	–
Venice	45,000	70,000	110,000	100,000
Paris	20,000	110,000	150,000	225,000
Genoa	–	30,000	100,000	58,000
London	25,000	25,000	35,000	50,000
Florence	15,000	60,000	95,000	55,000
Lisbon	15,000	–	35,000	65,000

Source: De Long and Schleifer (1993), Bairoch (1991)

Britain were probably the best representatives of such countries or regions on the rim of the continent suffering greatly from being irrelevant to the international trade flows of the time. Except for France, the governments of the other three must have become acutely aware of their irrelevance and sought solutions to reverse the situation. That became the driving force of expeditions and subsequent colonial expansion, together with religious zeal in the case of Portugal and Spain.

Notes

1. According to the United Nations International Trade Statistics (UN Comtrade) Yearbook (2016), in 2016 Asian exports to Europe totalled \$852 billion and European exports to Asia totalled \$800 billion.
2. All the World's Gold (2011).
3. Lopez (1976: 16–18).
4. Franck and Brownstone (1986).
5. Lopez (1976).
6. Beckert (2015).
7. Pedani (2010).
8. Doge Tommaso Mocenigo estimated, with some exaggeration, that the fleet consisted of more than 3000 smaller (17,000 seamen) and 300 large (8000 seamen) commercial ships and 45 galleys (11,000 seamen, 3000 carpenters, 3000 caulkers) protecting them (Crowley 2012).
9. Rosenthal (2013).
10. Pedani (2010).

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CHAPTER 2

The Pre-Industrial New World Order: Colonial Empires on Which the Sun Never Set

A plenty of rich land, to be had for little or nothing, is so powerful a cause of population as to overcome all other obstacles. No settlements could well have been worse managed than those of Spain in Mexico, Peru, and Quito. The tyranny, superstition, and vices of the mother-country were introduced in ample quantities among her children.
(Thomas Malthus)[1]

Post-medieval colonial empires emerged before the Industrial Revolution. They came in succession, and among them the British Empire formed the cradle of industrialized Europe. This chapter selectively reviews the process, which was untidy and brutal for millions of people.

2.1 Winners, Losers, and Definite Losers of the New World Order

Change inevitably produces winners and losers. The 'old' world order gave way to a 'new' world order in the sixteenth century, and the change produced losers (Ottoman Empire, Venice, and Genoa) and first-generation winners (Portugal, Spain, and then the Netherlands). In time, a second-generation winner would emerge, Great Britain, which would take over some of the bounties from the hands of the first-generation winners. Of course, there were definite losers, led by the original people of the Americas, India, and China.

M. A. Yülek, *How Nations Succeed*,
https://doi.org/10.1007/978-981-13-0568-9_2

In the fifteenth century, Portugal was one of the three dynamic and strong political organizations on the Catholic Iberian Peninsula on its way to completing the *Reconquista*. Muslim Spain, or Al-Andalus, which until the twelfth century shone as one of the most advanced civilizations of the time, weakened politically and militarily by the fifteenth century. That paved the way for the expansion of Portugal in the western Iberian Peninsula, together with the Kingdoms of Aragon and Castille in the central and eastern regions.

However, while Portugal had a long Atlantic coast, it was entirely cut off from the prosperous Mediterranean along with the spice trade. It lacked products to export and, indeed, its population needed to import merchandise. Consequently, it ran current account deficits, which required outflow of specie that it lacked. In any case, the volume of Portugal's total external trade was constrained by its inability to finance imports.

Arab navigators, along with Indians, and Persians, who procured spices from the Far East, kept the information of from where and how they sourced the products as top trade secrets. This and the difficult and risky voyages over the spice routes gave them, as well as the Mamluks of Egypt and Venetians, a high profit margin coveted by Western European sovereigns and merchants. That was the 'old economic order.'

Spices were quite important commercially. Europeans and Romans had "a high and constant demand for spices over almost a millennium."[2] As John Munro of the University of Toronto wrote:

> No economic historian of late-medieval Europe can ignore the importance of the spice trades and few can escape its fascinations. From the 12th to the 17th centuries, Oriental spices constituted the most profitable and dynamic element in European trade – the veritable cream that brought Italian merchants in particular enormous profits; and it may very well be that Italian dominance of medieval commerce and finance rested principally upon their control of the Oriental spice trades.
>
> Subsequently, the lure of enormous profits from the spice trades, along with a lust for gold and silver, were together the leitmotif – the chief incentives for European overseas explorations and colonization from the late 15th to 17th centuries.

Popular accounts of the value of spices are legendary:

> [A] pound of ginger was worth a sheep; a pound of mace was worth three sheep or half a cow and a sack of pepper was said to be worth a man's life! According to another estimate, Western Europe imported around 1,000 tons

> of pepper and 1,000 tons of other common spices annually during the late Middle Ages. These spices were equivalent to the annual supply of grain for 1.5 million people in terms of value. … Pepper was once so valuable that it could be used to pay the rent. … At one point in the 1300s, when tariffs were at their highest, a pound of nutmeg in Europe cost seven fattened oxen and was a more valuable commodity than gold.[3]

Poorer and warring Portugal must have deeply coveted the richer Italian city-states, especially Venice. Not only were the Venetians prosperous and economically dominant in Europe, they were also quite impious in the eyes of the Portuguese and were, de facto if not officially, very close allies of the Muslim Mamluks of Egypt. The profitable spice trade, a product of that alliance, made both parties quite rich. How could true Catholics ally with infidels and get rich? To eradicate and take over this Muslim-Venetian trade soon became a Portuguese obsession.

2.2 For Spices and Christians: Portuguese Trade Deficit and Colonization

Following their long-standing conflict with the Moors ending with the *Reconquista* of the Iberian Peninsula, Portugal and Spain needed access to wealth by conquering new lands and, in the process, converting their people to Christianity.

The Portuguese were desperate to find anything to trade on the West African coast. Along with the Spanish, they would, in fact, consider themselves extremely happy if they could find gold or silver to pay for their required imports. Even more enticing would be to discover precious metals, interesting merchandise, and resources in African regions that had no powerful political and military organization to defend themselves.

Portugal's endowment of a generation of ferocious warrior seafarers triggered maritime expeditions starting in the fifteenth century. Targeting first the northwestern and then western coasts of Africa, Portuguese sea commanders slowly gained familiarity with the new geography and new sailing techniques.

As their first attempts to trade with (or loot) the Moroccan coasts were costly and not really profitable, they had to head increasingly towards the southwestern coasts of Africa hoping to find some window of opportunity. As Bogart (1918: 31) remarked:

> [T]he first quest of the earlier expeditions was always gold, and the search for this elusive commodity led to the exploration of much of the two continents.

For Vasco de Gama, Portuguese colonialism was for "Christians and spices." He could have more precisely said for Christians, gold, and spices, as missionary zealotry and economic objectives played equally important roles in the process. By directly reaching the source of Indian spices, the Portuguese would inflict a deadly blow to the Muslim infidels and their Venetian collaborators. The Spanish were on the same page, although Christopher Columbus, unlike Vasco de Gama, was mostly commercially oriented.

Adventurous explorations triggered by poverty, lack of merchandise to sell, and a current account deficit led the Portuguese to master ocean navigation and ensue a bloody expansion to Africa, Asia, and South America. A major milestone in the bloody search for opportunities was Vasco de Gama's discovery of the Cape of Good Hope in 1497, which ushered in a whole new era and order in the world's economic history.

Growing trade within Asia from seventh until the fifteenth century gradually expanded to Europe. Important technological developments also helped in this process. Europeans, especially the Portuguese, learned from the Arabs how to build two-masted lateen caravels and developed them by combining square rigs with lateen sails. This enabled them to sail to East and West Indies and achieve expansive oceanic explorations.[4]

The sixteenth century thus witnessed a major change in the world order from Eurasian trade, which was based on the Spice Route and Silk Road, ending in the Mediterranean Sea itself dominated by the Italian city-states. Portugal and Spain were now brutally challenging the old order. The Dutch and English were to follow suit.

Portugal's Global Expansion

At the beginning of the sixteenth century, Portugal's colonies consisted of a few islands in the Atlantic and some posts on the western coast of Africa, primarily on the Bay of Guinea. A Portuguese fortress in Elmina (in today's Ghana) was the most important hub through which the Portuguese carried gold and slaves to Lisbon. The Portuguese also invaded the island of Sao Tome in 1493 in the Bay of Guinea to experiment with sugar plantations using imported slaves. It was not a spectacular experiment; total shipments per year were at the order of only a dozen.

Following Dias' and Vasco de Gama's expeditions (Fig. 2.1), the Portuguese rapidly established a network of around 50 newly acquired and fortified ports and stations extending from Lisbon to Malacca through Sofala and Mozambique on Africa's southeastern coast, Hurmuz in the

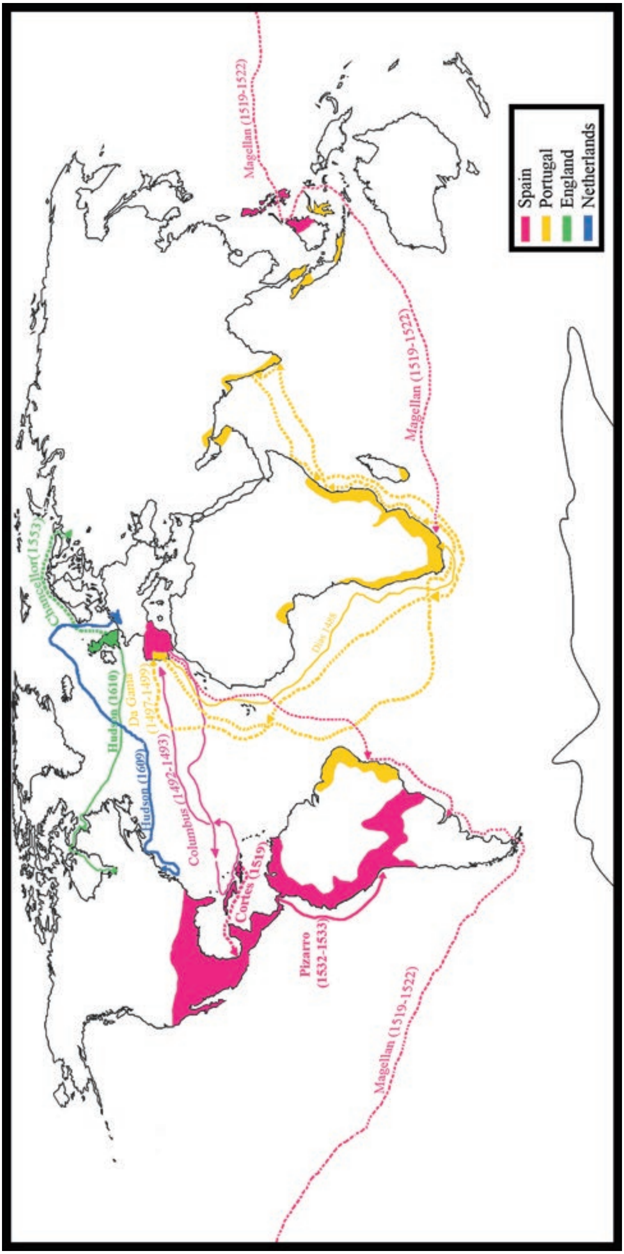

Fig. 2.1 Western European explorations

Persian Gulf, Goa and Calicut in India, Malacca in Malaya, and Macao in China. From Malacca, they traded with Japan through its southern port of Nagasaki.

The Portuguese objective was to cut off the existing sea trade from Southeast Asia to Venice through Egypt. Portuguese ocean expeditions and conquests were quite savage and bloody; Vasco de Gama famously pirated and torched Muslim trade and pilgrim ships, cut off the hands and noses of captured prisoners, and barraged port cities in Africa, Arabia, and India. When Alfonso de Albuquerque conquered Malacca, he spared all the Hindu and Chinese inhabitants but massacred all the Muslims.[5] Gustav Schmoller, the renowned German political economist, wrote in 1884:

> As in the East Indies, the ancient source of supply for oriental wares, for pearls and spices the Portuguese violently pushed their way in, first annihilated Arabian trade with unheard-of brutality, and imposed upon all the Asiatic tribes and states the rule that they should carry on trade with Portuguese alone; so in later times the Dutch were able to drive the Portuguese out to get for themselves a like monopoly of the spice trade, to keep other Europeans away by craft and by the mercantile talent, – if need were, by insolent violence and bloodshed, and to hold the people of the East in commercial subjection.[6]

The Portuguese were lucky that where they attacked, the local kingdoms were fragmented and often in competition with each other. When, for example, Albuquerque conquered Malacca and massacred the Muslim population, the sultan fled to Johore and established a new kingdom there. With all possibility, historians argue that they could have reclaimed Malacca had the Sultanate of Aceh joined forces with Johore instead of fighting with it. Ultimately, the political fragmentation of the locals also assisted the Dutch in taking over most Portuguese possessions in the East Indies, including Malacca in 1641.

The Portuguese aimed to hegemonize narrow but long sea routes with the objective of monopolizing the spice trade between Asia and Europe. Though Portuguese monopolization of the sea routes was never fully achieved, during the sixteenth century Portugal remained the only European power in the East Indies and was successful in capturing a significant part of the sea trade between Asia and Europe.

In the western hemisphere, as early as 1494, Spain and Portugal agreed to share South America through the Tordesillas Agreement. Consequently, while heavily focusing on the East Indies, Portugal received the eastern part of South America (modern Brazil) as a bonus, although its colonization started after the 1530s.

Unlike the western areas, the eastern areas of South America did not immediately offer gold or silver. So, it took some time (and competition from France) for Portugal to turn its attention to and concentrate on its dominion in South America. When it did so, it built an economy around sugar plantations. After Bahia was founded as Portugal's administrative centre in Brazil in 1549, the Portuguese used their experience in Sao Tome to rapidly turn Brazil into Europe's largest overseas sugar plantation by the end of the century. Portuguese ships carried slaves from Africa—and returned with sugar to resell in Europe.

In addition to selling Asian spices and South American sugar to Europe, the Portuguese colonial network sustained itself by trading gold from Zambesi with eastern spices as well as selling African slaves in Brazil and the West Indies. Slave traffic from West Africa to South America proved to be lucrative; it flourished immensely and led to Portugal's founding of Luanda (modern Angola) as a hub of the slave trade, where African slaves were bartered for low-quality Brazilian tobacco or Spanish silver.

In the golden age of its colonial empire, Portugal succeeded in monopolizing a wide network of global trade routes. It was a militarized trade network, subduing nations on the way. The economic surplus of the colonized nations, thus, formed the foundation of the glory in Lisbon.

2.3 Spanish Expansion into the Americas

Spanish colonization of Central and South America started as early as 1492 when Christopher Columbus established the first Spanish settlement, La Navidad, on the island of Hispaniola, on which today are the Dominican Republic and Haiti. The island then became the central base of Spanish action for the Americas. The indigenous tribe, the Taino, who welcomed Columbus, were soon wiped off the island by the colonizers and the infectious diseases they brought. This amounted to ethnical cleansing in today's terms.

The Spanish proceeded to invade the central and western regions of South America. The extant civilizations and cultures soon all but disappeared. Spanish colonization was famously bloody; some estimates place the number of indigenous deaths of up to 80 million[7] either by the swords of the Spanish or by the foreign microbes they brought. This figure is 15%

higher than the population of Western Europe at the time—about 16 times the population of Spain and about 65 times the population of Portugal at the end of the sixteenth century:

> In November of 1519, Hernando Cortes and his accompanying conquistadors became the first Westerners to gaze upon the magnificent Aztec city of Tenochtitlan, an island metropolis far larger and more dazzling than anything they had ever seen In Europe. Less than two years later that incredible city, which had had at least five times the population of either London or Seville at the time, was a smouldering ruin. Tenochtitlan, with its 350,000 residents, had been the jewel of an empire that contained numerous exquisite cities. All were destroyed. Before the coming of the Europeans, central Mexico, radiating out from those metropolitan centres over many tens of thousands of square miles, had contained about 25 million people -almost ten times the population of England at the time. Seventy-five years later, hardly more than 1 million were left. And central Mexico, where 95 out of every 100-people perished, was typical. In Central America the grisly pattern held, and even worsened. In western and central Honduras, 95 percent of the native people were exterminated in half a century. In western Nicaragua the rate of extermination was 99 percent – from more than 1 million people to less than 10,000 in just sixty years.[8]

The Spanish found rich silver reserves in their new dominions around which they developed an extractive colonial economy. The locals and imported slaves mined the silver and the Spanish treasure ships carried it to Spain and the Philippines, which were colonized during the reign of and named after Spanish King Phillippe II. On their return, these same ships carried slaves from Africa and Chinese silk from the Philippines. The silver was important, as it reduced the need for bartering and increased the purchasing capability of the Spanish. The Spanish used the silver to buy slaves from the Portuguese for their colonies or other materials from Europe. However, the Spanish economy soon recorded huge current account deficits despite the inflow of specie. The specie flow to Europe through Spanish treasure fleets soon created the infamous inflation in Europe that historians called the 'price revolution.'

A parallel economy emerged in the sixteenth century. English, French, and Dutch privateers attacked Spanish 'treasure ships' carrying gold and silver looted from South America.[9] Privateering, that is, pillaging of enemy ships by seamen in privately owned vessels, was officialized pirating. Letters of marque legalized their attacks against a set percentage of proceeds to be shared with the royal house. Until the nineteenth century, privateers constituted the bulk of European navies.[10] The inception of privateering was a way of 'privatizing' military action against enemies. In fact, Spanish plundering of South America rested on the same principle. For example, 20% of the proceeds of Cortes' plunder went to the Spanish king.

The Spanish economy, commerce, and military power, however, declined in the seventeenth century. Collapsed rather better defines the situation. Spain was not able to convert the booty from South American colonization into sustained economic value and institutions. It also lost some of its power and dominions in the Caribbean not only to the English but also to the Dutch and the French. In the first half of the century, Spanish ports in the Caribbean and sea trade with Europe were further damaged by Dutch pirating—not privateering, but buccaneering, which was pirating independent of any sponsoring crown—which was supported and sometimes legalized by the English and the French. Nevertheless, Spain's territorial colonies in South America other than in the Caribbean remained relatively intact and prosperous.

2.4 The Colonizer of the New Age: Britain's Ascendance to a Global Power

British colonial expansion followed the Portuguese, Spanish, and Dutch golden centuries. It unfolded in two phases: first was during the seventeenth century when it became a major colonizer in North America, and the second phase came in the eighteenth and nineteenth centuries when it became the dominant colonizer in the Caribbean and became the empire on which the sun never set.

Britain's Merchant Adventurers: Pioneers of British Global Expansion

Britain, geographically a European outpost, was clearly a latecomer to the flourishing trade with the Far East. At the end of sixteenth century, as Portugal, Spain, and the Netherlands later were the frontrunners in the quest for the colonization of the Americas, Asia, and Africa, Britain also started to move. It already had the experience of the *Merchant Adventurers*

Company, which received its charter in 1407 from King Henry IV.[11] It initially engaged in low-range trade with destinations such as the Netherlands, subsequently extending to some German Hansa League cities, Denmark, Norway, and Sweden. The company quickly grew to control the majority of British trade, predominantly woollen products sent to Antwerp to be transported to continental fairs.

During the mid-sixteenth century, Britain's new entrepreneurs emerged willing to engage in overseas trade. The *Mystery and Company of Merchant Adventurers for the Discovery of Regions, Dominions, Islands, and Places Unknown* was the first significant attempt and became a model for future companies, including the British East India Company. Its objective was to find a sea route to China through the northern seas, as rivals dominated the southern routes. More or less modelled after the Merchant Adventurers Company of the fifteenth century, it was formed in 1551 and mounted its first expedition in 1553.

The expedition was a failure and a boon at the same time. Two of the three ships were lost; however, one was able to accidentally reach today's Arkhangelsk, which was a territory recently annexed to Moscow by Tsar Ivan IV. The tsar was interested in meeting with Richard Chancellor, one of the founders of the English company and the captain of the ship. This led to the opening of trade of British wool and Russian furs and other goods between Britain and Russia.

The tsar welcomed this opportunity, as his country was landlocked and was in rivalry with Poland, Sweden, and Lithuania. Upon Chancellor's return to London in 1554, Queen Mary I chartered the company in 1555 under the name of the *Muscovy Company*. The Muscovy Company was then able to receive concessions from Ivan IV, including navigation and trading rights along the Volga River, establishment of a colony, and permission to arrest. In the second half of the seventeenth century, the Muscovy Company continued land route expeditions from Moscow to Western and Central Asia. The expeditions were successful, but were not continued and relationships between England and Moscow worsened, leading to the abolishment of the Muscovy Company's concessions.

The company carried the monopoly rights of British-Russian trade until 1698 in addition to a monopoly on whaling. However, the relationship between England and Russia worsened throughout the century and led to the demise of the Muscovy Company. Ultimately, the company nominally survived until the Russian Revolution in 1917.

The First Phase of English Global Expansion: Colonization of North America

In the first phase of colonization during the seventeenth century England's domination of the eastern coast of North America extended from north of Florida in the south to Massachusetts in the north through colonies created by royal charters. Thus, England's American territories became neighbours with French Acadia to the north and Spanish Florida to the south.

Religious and commercial reasons played a key role in this colonization process when the English Crown competed with the Spanish, Dutch, and, to some degree, the French. The ultimate result was either usurpation or purchase of lands of the indigenous peoples of North America, who were wrongly called Indians after the initial mistaken discovery of America, which was thought to be India. Given its distance to England, the colonizers had to develop their own ways of life and administration, although the Crown jealously pursued loyalty.

When necessary, the colonists massacred and confiscated the lands of the indigenous tribes. That happened despite the undeniable support from American Indians for the colonizers. Garraty (1979: 14) explains:

> It is quite likely that the settlement would not have survived if the Powhatan Indians had not given the colonists food in the first hard winters, taught them the ways of the forest, introduced them to valuable new crops like corn and yams, and showed them how to clear dense timber by girdling trees and burning them down after they were dead. The settlers accepted Indian aid, then took whatever else they wanted by force.

Whereas failure of resistance helped English colonization, there were still difficulties. The settlers faced immense difficulty at the beginning, and it even seemed as if they would share the fate of the English colonists from a century before. Malaria, starvation, and weak colony organization in the totally new environment led to mass deaths; 4000 colonists died between 1606 and 1622 out of a total of 6000 sent by the London Company, with the total population falling to 1300 by 1625.[12] In time, however, the settlers adapted to their new conditions and survived.

In the second half of the sixteenth century, when Queen Elizabeth I (1558–1603) was building power in the British Isles, adventurer soldiers like Humphrey Gilbert and his half-brother Walter Raleigh were the pioneers of the attempts for the future British Empire. Though unsuccessful, Gilbert and Raleigh's attempts to establish colonies in North America paved the way to their and England's quick rise to wealth.[13]

Against this backdrop, initiation of the English colonial expansion in North America came with Elizabeth's successor, King James I (1603–1625). At the time, the United Provinces (the Netherlands) and Spain were considered the masters of European overseas expansion. However, England was both lucky and savvy in targeting colonial opportunities in northwestern regions of today's USA. Those regions were selected due to their relative proximity to England and also because they were not yet under the rule of the Spanish. It is also worthwhile to note that early British masterminds considered establishing colonies in addition to looting Spanish treasure ships.

English colonization of America took two different roads: commercial and religious. Commercial colonization was undertaken through the London (or Virginia Company of London) and Plymouth Companies. London merchants established the London Company in 1606 as a joint stock company. Its charter stated its objective to bring the "infidels and savages, living in those parts, to human civility," notwithstanding the colonizers' right "to dig, mine and search for all Manner of Mines of Gold Silver and Copper."[14] It founded the Jamestown settlement in what is today Virginia in 1607.

The Plymouth Company was established in 1606 by a group of merchants from Bristol and Plymouth. Upon receipt of the charter, it carried a small group of colonists to the shores of the Kennebec River in 1607. However, the colony was quickly abandoned. Until 1620, there was very little activity in the region when the Plymouth Company was reorganized with the name of the *Council for New England*. It granted settlers areas under its jurisdiction, including today's states of Maine and New Hampshire and the region between the Charles and Merrimack Rivers, where the city of Boston was subsequently founded by the *Massachusetts Bay Company*.

In 1620, a group of dissenting Puritans in England set sail to North America on a ship called the *Mayflower*. In harsh weather, the around 100-strong *Pilgrims* (of which 35 were English men and women who earlier had immigrated to Leyden for purposes of religious freedom) reached *Cape Cod Bay* in today's New England instead of the planned destination, the mouth of the Hudson River. The Puritans claimed that where they landed was outside of the London Company's patent and established their own government. Other migrants from England then joined the Puritans. The Massachusetts Bay Company established a primitive form of a democratic system with selected 'freemen' who were granted the right to select their governor.

Continuing to the 1680s, other English colonies were established in New England for religious and economic reasons. Entrepreneurial colonizers were the key drivers of the process. Roger Williams, a dissenting Puritan who received a charter in 1644, established Providence in 1636. Thomas Hooker established Connecticut through a charter in 1662. In 1632, Cecil Calvert, the Baron of Baltimore in England, received the charter for Maryland. To encourage colonizers, Calvert issued the Toleration Act that guaranteed religious freedom in his dominion. King Charles II took over *New Amsterdam* from the Dutch and renamed it New York. The estate included New Sweden, which the Dutch had taken over from the original founders. He subsequently gave today's New Jersey to two friends. In 1663 and 1665, Charles II granted the charter for the Carolinas, which were named after him, for the regions extending to the south of Virginia to eight noble English investors. Today's Pennsylvania was granted in 1681 to William Penn to cover King James II's debt to Penn's father. Thus, although much smaller than Spain and France, by the end of the sixteenth century, Britain had a considerable handful of North America obtained free of charge from the indigenous peoples.

The Joint Stock Company, the Crown's Charter, and the Colonies

Portuguese, Spanish, and French colonial conquests in the Americas were legally treated as territories belonging to the respective crowns. The English (and the Dutch), on the other hand, introduced an administrative innovation in the form of the joint stock company. The Italian business contract and company forms *societa*, *compagnia*, and then *commenda* were probably the direct precursors of the joint stock company. In turn, the *societa* and *compagnia* probably evolved from the Islamic contracts that appeared in Venetian sources under the Italian term *rogadia*.[15] The contracts allowed close relatives to pool their resources to undertake trade enterprises. An important drawback limited the utility of such company forms, since all partners were jointly and unlimitedly liable for the debts of other partners. In other words, a partner's wrong decision in another enterprise could bankrupt any unaware partner.

The Italian *commenda* provided an important base for the development of business in Italy and then Europe. It was significantly superior to the *compagnia* in that it allowed limiting risks to the enterprise undertaken and sharing of risks among investors. In the Islamic and pre-Islamic Arabian contract *modaraba* (or *qirad*), the *modarib* would undertake the management of the trade enterprise without the need to commit capital (Pryor 1977). In case of profit, he and the capital(ist) partner would receive their pre-agreed shares. In case of loss, the *modarib* would lose only his time and effort, and the capitalist, his investment.

The English and Dutch joint stock companies carried three important innovations compared to their Italian precursors with important economic implications. Firstly, unlike Italian companies, the joint stock company opened the door to capital pooling and risk sharing by many shareholders, so private savings were thus channelled into profit-seeking colonization enterprises. That removed the necessity of crown funds to finance initial and later voyages as well as the establishment costs of a colony.

Secondly, monarchs granted the company charters. The charters were permission for the company to colonize new territories and generate income from them. Thus, unlike its competitors, the English and the Dutch action was something like a public-private partnership in today's terms instead of the Latin version, which was based on empirical enterprise.[16] More importantly, these charters granted monopoly rights to the joint stock company on all economic activity in the colony, including trade with England.

Carolina's charter of 1663 granted by King Charles II, for example, permitted the company all the rights to the natural resources in the region—gold, silver, agricultural opportunities, fish and game and their products, and so on—together with the duty to build churches:

> Whereas our right trusty, and right well beloved cousins and counsellors, Edward Earl of Clarendon, our high chancellor of England, and George Duke of Albemarle, master of our horse and captain general of all our forces, our right trusty and well beloved William Lord Craven … being excited with a laudable and pious zeal for the propagation of the Christian faith, and the enlargement of our empire and dominions, have humbly besought leave of us, by their industry and charge, to transport and make an ample colony of our subjects, … in the parts of America not yet cultivated or planted, and only inhabited by some barbarous people, who have no knowledge of Almighty God.
>
> … and whereas the said Edward Earl of Clarendon, … and Sir John Colleton have humbly besought us to grant … unto them and their heirs, the said country, with privileges and jurisdictions … all that territory or tract of ground, situate, lying and being within our dominions of America, extending from the north end of the island called Lucke island, … to the … south seas aforesaid; together with all and singular ports, harbours, bays, rivers, isles and islets belonging to the country aforesaid; and also all the soil, lands, fields, woods, … within the bounds or limits aforesaid, with the

> fishing of all sorts of fish, whales, sturgeons … in the sea, bays, islets and rivers…; and moreover all veins, mines, quarries, as well discovered as not discovered, of gold, silver, gems, precious stones, … within the countries, isles and limits aforesaid.
>
> … and furthermore, the patronage and advowsons of all the churches and chapels, which as Christian religion shall increase within the country, isles, islets and limits aforesaid, shall happen hereafter to be erected, together with license and power to build and found churches, chapels and oratories, in convenient and fit places, within the said bounds and limits, and to cause them to be dedicated and consecrated according to the ecclesiastical laws of our kingdom of England, together with all and singular the like, and as ample rights, jurisdictions, privileges, … within the countries, isles, islets and limits aforesaid.[17]

Thirdly, major company charters came with monopoly rights for trade. The first joint stock company which sought monopoly rights for trade was the Muscovy Company chartered in 1555. However, the Dutch East India Company (Vereenigde Oost-Indische Compagnie, or VOC), chartered in 1602, and the English East India Company, chartered in 1600, were the ones that would influence the lives of millions of people in India and Europe. The result of political-economic decisions, these companies paved the way for militarized, monopolized, and large-scale international trade as well as for the British and Dutch global empires.

The Second Phase of British Global Expansion: The British East India Company and the Colonization of India

The first British expedition sailed around the Cape of Good Hope as late as in 1591—a century after Vasco de Gama. It was not quite successful; only one of the three ships successfully returned to London after reaching Kanyakumari, the southernmost port of India, and the Malay Peninsula. After other unsuccessful attempts, the *Governor and Company of Merchants of London trading with the East Indies*, which was better known as the English (later British) East India Company, received a charter from Queen Elizabeth I on the last day of the year 1600. The charter meant that the English East India Company would have the monopoly in England to trade with the East Indies.

The British East India Company became the main vehicle of Britain's imperial expansion, which by the end of the nineteenth century encompassed one-fifth of world's land surface and one quarter of the world's population. By the beginning of the nineteenth century, it had a private armed force of 260,000 men.[18] It conquered India and other territories with its own army (with the help of the strong British navy) and officially or unofficially ruled large territories. At its zenith, it accounted for half of the world's international trade and controlled the trade of many important goods such as silk, cotton, indigo, salt, and tea.

In 1778, it hung Spiridione Roma's painting *The East Offering Its Riches to Britannia* (Fig. 2.2) on a wall at its headquarters. The painting was probably inspired by Pieter Isaacsz's painting of 1606 that showed Amsterdam as the centre of world trade.[19] Roma's painting was a simple reflection of Britain's new imperial conception of ruling the world. The picture conceived women and men (mostly dark skinned) representing India and China, Africa, and the Americas—in other words, the world—offering gold, jewels, cotton, Chinese porcelain, and tea to Britain, represented by a noble-looking, pale-skinned lady. Note that when the painting was hung on the wall, China was not under British control. The painting

Fig. 2.2 *The East Offering Its Riches to Britannia* by Spiridione Roma

also features Old Father Thames representing London and a frightening lion, the traditional symbol of British power. More importantly, *Mercury*, the Roman god of financial gain, travellers, merchants, thieves, and trickery, prominently appears in the painting as the master of the ceremony. Is that a hint, among others, that the British East India Company considered the British Empire as the new Rome? A ship in the background of the painting is also flying the British East India Company flag.

England, which after the incorporation of Scotland in 1707 became the *Kingdom of Great Britain* (and then the *United Kingdom of Great Britain and Ireland* in 1801 after the incorporation of Ireland), gradually built its colonies in the East Indies during the eighteenth and early nineteenth centuries. Ultimately, the British largely displaced the Dutch, who in turn had taken over the routes from the Portuguese.

Britain Gaining Full Control of India

From 1707 to 1805, the political map of India changed almost entirely from being dominated by the Moghul Empire to being part of the British Empire. During the nineteenth century, the British controlled the subcontinent, which had a population of 239 million people in 1872,[20] according to the first British census there. To put the colonizer and the colonized in perspective, Britain's population in 1850 was 27 million[21] and its military force in India was less than 100,000—excluding an additional 150,000 or so native Indian soldiers in the British Indian army. The story of how the jewel was embedded in the Crown is a mixture of Britain's prowess, audacity and diplomacy, and political and military fragmentation in India.

Babur established the Moghul Empire in 1526 after defeating Ibrahim Lodi of the Delhi Sultanate in the Battle of Panipat. His descendants expanded the empire's territory by military might as well as by alliances, including through marriages with local families. During the golden age of the empire, around the mid-seventeenth century under Akbar, the civilization and its science and social harmony peaked and valuable Moghul art and architecture acquired worldwide fame. At the same time, the prosperity the Moghul Empire had established attracted European interest in trade. Portuguese conquests and settlements in India, starting with the Vasco de Gama's invasions in 1498, soon multiplied on both the east and west coasts. British, French, and Dutch settlements followed.

Upon the death of Aurangzeb in 1707, the borders of the empire, at their zenith, extended from Kandahar in the northwest to close to the tip of the subcontinent to the south and Bengal in the east to Baluchistan in the west, which also mounted increasing pressures on the empire. In the south, the Maratha chiefs challenged the empire and, concurrently, north-eastern provinces effectively gained their independence. More importantly, the British and French engaged in a competition to control Indian trade as well as territory in the eighteenth century, and from 1740 to the end of the century, a series of wars occurred between the British and local powers. In 1756, Robert Clive, an able military commander of East India Company, enticed Mir Jafar, an ally of Siraj ud-Daulah, the Nawab of Bengal, to replace him. Mir Jafar's consequent betrayal at a critical moment of the war helped the British win the victory in Plassey against Siraj ud-Daulah.

After the victory, Mir Jafar was appointed Nawab and the East India Company shipped a significant part of Bengali treasure in the order of £2.5 million to London. Clive became immediately rich in the process, receiving £234,000.[22] The total annual revenue of the UK averaged £7.4 million between 1750 and 1759,[23] and the booty following the victory was equivalent to one-third and Clive's share another 3% of Great Britain's annual fiscal revenue. Shortly afterwards, the East India Company received the authority to collect taxes from more than 10 million Bengalis at a time when the population of Great Britain was 7 million. As a result, the East India Company's stock price peaked.[24]

That was why Clive described Bengal as "an inexhaustible fund of riches." Indeed, after the victory, Clive and British traders immediately became wealthy. After becoming a member of the House of Commons, Clive was censured for the acquisition of his Bengali wealth and ultimately committed suicide at the age of 49. The Hindi word *lut* entered the English language as loot after Clive.[25]

Decisive wars took place between the Kingdom of Mysore and the British between 1767 and 1799. Tipu Sultan of the Kingdom of Mysore, who was a well-educated and innovative statesman, had led the development of a strong army and weapons. The Mysore army was probably the first one in the world that used rockets with steel casings. Tipu Sultan's cooperation with the French also helped him further train his army and win several important battles against the British. However, with the increasing cooperation between Mysore and Napoleonic France, the British East India Company raised a military campaign against him, and the British decisively won the last battle in 1799. Following the victory, the British defeated the remaining resistance from Maratha and cleared the way for sole control of the Indian subcontinent by 1805.

Gaining control of the Indian subcontinent by the end of the eighteenth century, Britain became the dominant European force in the East Indies, surpassing the Netherlands for the first time, clearly as the top colonialist of the world. Britain made this possible both through military victories and skilful politics of playing local leaders against each other.

After India, Britain further extended its control to parts of Malaya and established the port and entrepôt of Singapore in 1819 as a crucial port on the way from India to China. The Dutch had maintained rather tenuous control in different parts of Indonesia from the seventeenth to the twentieth century. For a brief period at the beginning of the nineteenth century, the British took over control of a minor part of the archipelago following the French occupation of the Netherlands only to exchange it back with the Dutch for control of Malacca and newly established Singapore.

The Dutch: England's Friend and Also Foe in the Quest for Domination of Global Trade in the Seventeenth Century

England and the Dutch United Provinces had a mixed relationship as friends and foes from the fifteenth through the seventeenth century. Neither of the two was a major power in Europe or on the seas in the fifteenth century when Venice was the main European sea power, together with runners-up Genoa, Portugal, Castile, and Aragon, and the Habsburgs were the main land power in continental Europe, themselves threatened by the expansion of the Ottoman Empire.

In the sixteenth century, the Anglo-Spanish rivalry meant that any improvement in Anglo-Spanish relations led to worsening Anglo-Dutch relations, and vice versa. To counter Spain, Elizabeth I built England's first major navy, which was successful in harming Spanish Habsburg interests through privateering and pirating. She also provided assistance to the Dutch in revolt against their Spanish occupiers and signed the *Treaty of Nonesuch* with the Dutch United Provinces in 1585 against the Spanish forces. However, at the beginning of the seventeenth century, England's relations with Spain improved, culminating in a peace treaty in 1605, which led to a brief decline in the perceived importance of the navy in England until the Anglo-Spanish war of 1625.

While fighting a war of independence with the Habsburgs in the first half of the seventeenth century, the Dutch gained significant power commercially and militarily, possibly possessing the largest fleet the world had seen with an estimated 2500 vessels. The English fleet had far fewer ships, with 180 vessels.[26] Consequently, from humble yet promising beginnings of dominating the timber trade between the Baltic and North Seas—on which the Dutch and the British shipbuilding industry depended—the Dutch fleet rapidly expanded in number and its territories reached and controlled the East Indies. The Dutch also expanded their commercial power in Northwestern Europe, including in the Baltics:

> [T]he Dutch destroyed the Hanseatic trade in their own markets by differential duties; while they and the English made the direct trade of Germans with Spain and Portugal impossible, by violence and the confiscation of the ships; the Dutch misused, with increasing dexterity their growing preponderance on the Rhine and in the Baltic to put Germany itself into a position of unworthy dependence in all matters of business. As the only or most important purchasers of German raw products and the only suppliers of Indian spices, they secured an almost intolerable monopoly, which reached its climax through the unconditional dependence of Germany on the Dutch money market during the period 1600–1750.[27]

The innovative Dutch shipbuilding industry played an important role in growing Dutch supremacy through the mass production of *fluyts*—Dutch commercial vessels that were improved versions of the classic galleons. Fluyts were efficient vessels with very large cargo holds for their time, as, unlike the standard practice at the time, they were not built to be converted into war ships when needed. Dutch shipyards in Zaandam (Amsterdam), and elsewhere, were able to build fluyts very quickly. With this and the Flemish fleeing from south Flanders, Amsterdam quickly became a very large port from the small port city it had once been specializing in the Baltic timber trade. In the process, the United Provinces became a maritime nation. According to some sources, 10% of its male population was employed in the industry.

Moreover, the Dutch built efficient business organizations and human capital. This was coupled with a wide range of innovation across the economy and society, one example of which was the invention of the wind-powered sawmill, which became an important factor in increasing the overall efficiency of the Dutch economy. The most important of the organizational innovations was the joint stock company, as mentioned earlier. Later, the Dutch also developed financial institutions and instruments, which turned Amsterdam into a major financial centre in Europe.

As the first major organizational innovation, the Dutch East India Company became the largest commercial organization in the world by 1620, soon after its establishment in 1600. It quickly established its own sea routes to the East Indies, China, and Japan, passing the Cape (modern South Africa), Mauritius, Cochin in India, Colombo in today's Sri Lanka, and Bantam and Batavia in today's Indonesia. The Dutch also took Malacca from the Portuguese in 1641, which ended the Portuguese suzerainty over the port that it had held since 1511. The Dutch also tried to wrest Macao from the Portuguese, but were expelled.

In the seventeenth century, the Dutch ultimately took over Portugal's colonial ports in the East Indies and mostly monopolized the ocean trade routes between Europe and Asia, especially the trade in spices and textiles. They were interested in commercial profits, not conquering territory. The latter required more men and did not yield attractive returns on the capital and effort. Under increasing competition from this able rival, Portugal had to leave the East Indies to turn its attention more to South America. The Dutch tried to take over Portugal's South American and West African holdings as well, and were successful for a while. However, after 1640, they had to return them as Portugal pressed.

In the first half of the seventeenth century, the Dutch, together with the British, were on the way to become the Protestant powers in Europe. But at the same time, the two were in direct competition with each other, and the Dutch were in the clear lead. It took the British more than a century-and-a-half to confidently raise the flag of the empire on which the sun never set by overtaking the Dutch dominance in the East Indies.

At the time, the British rightly considered the Dutch as the superior rival and tried to imitate them by building English versions of fluyts (and new warships) to expand their fleet as well as by reforming its government administration and building overseas trade posts and colonies. Charles I of England also tried to cooperate with Spain in order to damage Dutch commercial interests by, for example, abolishing Dutch fishing rights in the North Sea. However, the Dutch were quite powerful and made Charles regret this policy when they defeated the Spanish navy nominally supported by the English in the *Battle of Downs* in 1639. Nevertheless, when England mended relations with Spain, it turned its attention more to the rapidly prospering Netherlands both with envy and with enmity. The Dutch threatened England commercially both by increasing its control of fishing in the North Sea and by limiting England's trade with English colonies in the East Indies.

The English were bitter about the Dutch aggressiveness, of which the Amboyna massacre is a prime example. In order to break into the flourishing East Indies trade now dominated by the Dutch, the English East India Company established a trade post on the small island of Amboyna near

Moluccas (Indonesia). The Dutch, who felt that any potential threat to their domination had to be destroyed, responded fiercely, massacring all the English inhabitants of the island in 1623. The English also remembered the ungratefulness of the Dutch towards the earlier English assistance against the Spanish. And now, Anglo-Dutch competition had become more intense over the Spanish and Portuguese colonies.

In the mid-seventeenth century, England ended up in the strong administration of Oliver Cromwell after the English Civil War. The Netherlands, on the other hand, decided to reduce its war budget after the Treaty of Munster (1648) with the Spanish, which meant the decommissioning of the United Provinces navy and the beginning of William II, Prince of Orange[28] losing his power. He then abruptly died in 1651, making civil war possible. Thus, by 1651 there was a leadership vacuum in the United Provinces that Oliver Cromwell, who was a strong leader and had begun to rule in England, probably considered an opportunity.

As relations with the United Provinces worsened, Cromwell, who ruled only until 1658, quickly built up a powerful navy and strengthened overall organizational efficiency in England, paving the way for ultimately overtaking the Dutch colonial empire a century later. Nevertheless, in the three Anglo-Dutch wars between 1652 and 1678, the Dutch mostly dominated until 1689, when William III, Prince of Orange became king of England, Scotland, and Ireland.

The Simple Economics of the British Colonies in America

At the beginning, the economics of British colonization in America did not look profitable or sustainable. The colonizers met many hardships. The new land was not adequately populated and did not offer immediate economic returns. In time, however, colonization became more rewarding for the colonizers, the shareholders of the colonizing companies, and the Crown.

The economics of the colonizing company were simple; it would ship volunteers who lacked opportunities in England to the colonies without asking for any payment. In turn, the volunteers would work and pay the company back, generating profits for the latter. Generation of income necessitated production and export of new agricultural products, and the colonies exported whatever they could produce to the motherland. They imported merchandise and equipment from England and slaves from Africa. British colonies received the first slaves to work on tobacco plantations in the 1620s. The capital cost was lowered through land grabs, taking over the land from the indigenous people at no cost other than bloodshed.

Labour was cheap, and the colonizers worked men, women, and children. African slaves and convicted criminals from Europe also joined them in time. Slaves were worked until they died and produced offspring, whereas criminals worked for a fixed term determined by the courts.

The settlers looked for possible export items, and tobacco would prove to be the most important export item for the colonies as demand from Europe grew. In the seventeenth and eighteenth centuries, it provided livelihood and survival for the British colonies in America. When, in 1612, British consumers liked the trial tobacco produced by John Rolfe in Virginia—the *Orinoco*, which came from the sweeter tobacco seeds he obtained from Trinidad—the fate of the new British colony was sealed to survive, unlike its unsuccessful predecessor a century earlier. Subsequently, other colonizers replaced the original Virginian tobacco seeds with Orinoco seeds. Colonies found almost an unlimited market for tobacco in Britain and exports increased rapidly from 20,000 pounds in 1619 to 22 million pounds in 1699.[29] Tobacco imported from its colonies replaced the Spanish tobacco imported to England, in turn helping the kingdom reduce its trade deficit with Spain.

Along with tobacco, the colonies in America sent other export items to the motherland. The list included indigo, rice, furs, and timber, which were relatively less important compared to tobacco. To benefit from the real cash crop, cotton, the early colonies would have to wait for about two more centuries. Only after the first phase of the Industrial Revolution in England did cotton become an export item even more important than tobacco.

Notes

1. Malthus (1798: 32).
2. Munro, J. H. (2009). See also Freedman (2008) among others.
3. Kumar (2016).
4. Campbell (1995: 4).
5. Headrick (2012).
6. Schmoller (1884: 65–66).
7. Malanima (2010).
8. Stannard (1992).
9. Walton (2002), Lane and Levine (2015).
10. Anderson and Gifford (1991: 100).
11. A royal charter is a formal document issued by a monarch granting permission and principals of organization and activity for an individual or legal person. Until recent centuries, a royal charter was the only legal foundation

that allowed the incorporation of a collection of individuals into a single legal entity. The English and subsequent United Kingdom issued over 1000 charters, starting with the charter that founded the University of Cambridge in 1231.

12. Garraty (1979).
13. Raleigh set up a colony of about 100 men on the east coast of North America, on land he named Virginia, after Queen Elizabeth I, who, being unmarried, was known as the "Virgin Queen." These settlers only lasted a year before returning home. Raleigh had become a member of the landed gentry after he led military expeditions in Ireland and confiscated the lands of the Irish natives in 1583. He received a charter from Elizabeth I to explore and colonize Virginia. However, the attempt was not successful, and neither were his subsequent attempts in today's Guyana and Venezuela to find *El Dorado*, the famed legendary city of gold. Gilbert secured Catholic funds and a patent from Elizabeth I in order to seize land in North America. His expeditions, however, bore little real fruit.
14. Garraty (1979).
15. Lopez (1976).
16. The initial Spanish and Portuguese action also featured a public-private-partnership flavour. Initial expeditions of de Gama and Columbus were financed by the crown. Later, the booties obtained from the Portuguese and Spanish plunders were legalized by royal charters granted to warrior-entrepreneur seamen. The charters defined the area of plunder and the share of proceeds to be left to the treasury in case of profits.
17. Charter of Carolina, 24 March 1663.
18. Robins (2006).
19. Robins (2006).
20. *Memorandum on the Census of British India (1872)*, presented to both houses of Parliament by Command of Her Majesty.
21. Mitchell (1975).
22. Robins (2006).
23. De Vries (2012).
24. Robins (2006).
25. Tharur (2015).
26. National Geographic. http://channel.nationalgeographic.com/videos/dutch-shipbuilding/.
27. Schmoller (1884: 74).
28. William II, Prince of Orange was the stadtholder of the United Provinces and its leader throughout the process of the Netherlands' rise.
29. Davis (1954: 151–152).

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CHAPTER 3

British Colonial Empire and Industrial Policy: Protection, Monopolized Trade, and Industrialization

British colonization of the world came in two phases. The first phase unfolded during the seventeenth century and the second—major one—in the eighteenth and nineteenth centuries. The second phase coincided with the Industrial Revolution and gave rise to a completely new international order—a post-industrial new world order different from the 'old' and 'pre-industrial new' world orders.

The Industrial Revolution in Great Britain started in the mid-eighteenth century. Between 1760 and 1860, the British share of the world's industrial output went up from 1.9% to 19.9%.[1] This was due in large part to increased labour productivity caused by industrialization and was at a time when the world population was 1.2 billion,[2] whereas the British comprised only 2%.

The growth of manufacturing capacity soon led to the quest for external markets, as the domestic market was quickly saturated. However, protective policies in fellow European nations and their sizes did not allow large amounts of exports of British industrial goods into continental Europe, which meant that the search had to be shifted to further afield.

In addition to markets, British industries needed raw materials. Some of them, such as the crucially important cotton, were simply not produced in Great Britain due to the unfavourable climate. For others, there were different reasons to import such as inadequate domestic production or ability to import at much cheaper, sub-market prices from other countries such as India, which Britain controlled anyway.

M. A. Yülek, *How Nations Succeed*,
https://doi.org/10.1007/978-981-13-0568-9_3

By the second half of the nineteenth century, the UK produced half of the world's iron, coal, and lignite. And just as important, as Paul Kennedy (1989) notes, it consumed just under half of the world's raw cotton output and its energy consumption was five times that of the USA and Prussia, six times that of France, and 155 times that of Russia.[3] Thus, Kennedy (1989) considers it no surprise that the Victorian economist Jevons famously boasted:

> The plains of North America and Russia are our corn-fields; Chicago and Odessa our granaries; Canada and the Baltic are our timber-forests; Australasia contains our sheep-farms, and in South America are our herds of oxen; Peru sends her silver, and the gold of California and Australia flows to London; the Chinese grow tea for us, and our coffee, sugar, and spice plantations are in all the Indies. Spain and France are our vineyards, and the Mediterranean our fruit-garden; and our cotton-grounds, which formerly occupied the Southern United States, are now everywhere in the warm regions of the earth.[4]

Where possible in these markets, Britain monopolized the trade of raw materials and end-products—as, for example, through the East India Company in Asia—enabling Britain control prices of both. By time, as Britain became an industrialized country, it turned to free trade agreements on the back of a thriving need for territory from which raw materials could be exploited and to which finished goods were to be exported. Great Britain was then the factory of the world, as China is today—the major difference being that the international trade of today is much freer compared to the monopolized, hegemonic trading system of the nineteenth century.

3.1 Britain's Trade Prior to the Industrial Revolution

To appreciate how trade helped the Industrial Revolution to move full steam ahead and led the British economy to dominate the global economy in the nineteenth century, one needs to first review the humble beginnings of British trade. The structure of British foreign trade until the first half of the seventeenth century—that is, before its major trade expansion and colonization—was quite dull in terms of composition and trade partners.

Britain traded with a few partners and in a few categories of commodities. Trade—both exports and imports—was quite low in terms of values and volume. England did not have much to offer the outside world. Wool—and woollen textiles after Edward III—was the only major export item, accounting for 80–90% of all exports. The rest was primarily made up of fish, tin, and lead. Imports, on the other hand, were textiles primarily from Flanders, and spices, fruits, and luxury foodstuff from the East Indies. Britain also imported wine and raw materials, including timber and metals, for construction and shipbuilding.

With the start of colonial expansion in the second half of the seventeenth century, British foreign trade slowly started to expand. Imports grew by one-third and exports by almost 60% in less than four decades after 1660 (Table 3.1). Non-European and Mediterranean exports (15% of total exports and re-exports in 1699) helped Britain's trade growth. Re-exports then constituted 31% of all British exports, with the share of wool falling to around 50%. Re-exports were merchandise that British merchants imported from one country—of which a significant part was from the empire's colonies—and exported to another country—again, of which, a significant part was its colonies, and around one-third of its imports came from outside Europe.

Britain was now a growing trading nation thanks to colonization, re-exporting what it imported from others, in addition to exporting its limited menu of domestically produced items. More importantly, Britain looked like an industrialized nation already, as manufactured goods represented 80.8% of total exports (Table 3.2) at the end of the century.

Table 3.1 English foreign trade in the second half of the seventeenth century (thousand pounds sterling)

	1663–1969	*1699–1701*
Exports	4100	6419
London	2039	2773
Other ports	1200	1660
Re-exports	900	1986
Imports	4400	5849
London	3495	4667
Other ports	900	1182

Source: Davis (1954: 160)

Table 3.2 British exports and destinations, 1699–1701 (thousand pounds sterling unless otherwise specified)

	Europe, Ottoman Empire, and North Africa	*West Africa, America, and the East*	*Total*	
Exports	3772	661	4433	69.1%
Manufacturing	2997	586	3583	55.8%
Manufacturing (% of total exports)	79.5	88.7	80.8	
Textiles	2815	310	3125	
Re-exports	1660	326	1986	30.9%
Total exports and re-exports	5432	987	6419	100.0%
	84.6%	15.4%	100.0%	

Source: Davis (1954: 151)

Although the first phase of trade expansion was still limited in size, it was also useful in terms of the increasing wealth and capital as well as increasing purchasing power in Britain (and Europe) due to the fall in commodity prices. Three main commodities accounted for one-third of British imports and one-third of British re-exports: tobacco, sugar, and calicoes. They and other imports such as Indian silks, pepper, and non-calico textiles led to the drastic fall in merchandise prices in England and a corresponding increase in purchasing power. For example, when imports from Virginia and the British West Indies soared, the price of tobacco (which was a luxury) fell from 20 to 4 shillings a pound before 1619, and fell to 1 shilling or less by 1670. Sugar imports from the British East Indies also increased rapidly, with one-third of these imports typically re-exported.[5]

During the second half of the seventeenth century—before the generally accepted start of the Industrial Revolution—non-textile (i.e. non-woollen) manufactured goods constituted less than 10% of British exports. Their growth, however, which was predominantly fed by British exports to its colonies, was impressive, as they almost tripled in less than 40 years.

The colonies were allowed to import goods only from Britain and British manufactured goods were protected from competitors. This played an important role in the increasing British exports of non-textile goods. Davis (1954: 154) explains:

> The colonies provided market in which English manufactures were protected, in which they had little native competition, and which had an absorptive capacity rapidly extending as colonial [raw material][6] exports grew. … Thus, in the seventeenth century, the English brass-, copper-, iron-ware, silk and linen, hat-making and tailoring, glass-, earthen-ware, paper, cordage and leather industries, and others, were being fostered by their protected market across the Atlantic, gaining strength with which they would later emerge into competition with Europe and further modify the structure of English trade.

In short, the expansion of Britain's international trade started before the Industrial Revolution, spurred by the first phase of British colonization. It is noteworthy that manufactured goods constituted the lion's share of British exports even before the Industrial Revolution.

3.2 The Industrial Revolution and the Expansion of Trade in the Eighteenth Century

Great Britain is considered to be the cradle of the Industrial Revolution, the timing of which is debated. In the second half of the sixteenth century, England's exports of manufactured goods to colonies had already started to rise, but the generally accepted notional time for the start of the Industrial Revolution is the mid-to-late seventeenth century. The genesis of the revolution was the textile industry in Lancashire. Inventions of new technologies led to mechanization of textiles, which, in turn made Lancastrian workers the most productive textile workers in the world. The same number of workers was now able to manufacture much larger quantities of output in money and quantity terms.

What, however, was to be done with the exploding productivity and production when a small island's population got saturated with new products and growth of demand faded? After all, a population of about 10.5 million at the end of the eighteenth century—which was not too significantly different from the island's population in the thirteenth century—could only create demand for a fraction of the rapidly increasing output. The population of Great Britain grew rapidly to 42 million by 1901, quadrupling in one century through the riches obtained from colonization and industrialization. But even that was very small compared to the increase in the industrial productivity.

The answer to the limits of the small domestic market was simple: exports. Britain needed export markets to keep its factories running and excess production had to be marketed in the wider world. Consequently, as Manchester became a flourishing town of cotton textile mills, Liverpool became a major port for exports of cotton textiles and imports of raw cotton. In the process, British exporters penetrated markets around the world by incorporating new territories into the Commonwealth or forcing them to sign free trade agreements.

Given competition, protection, or at least impediments in other countries in Europe, the UK's colonies were the most important ingredient for the expansion of its exports. By the end of the nineteenth century, Britain had truly become the empire where the sun would seemingly never set. Its territorial control or influence extended from the West Indies and North America and from Egypt and Cyprus to the Indian subcontinent and China. The motherland wanted to extract as much economic value as possible from the territories it ruled officially or had de facto control over. It thus capitalized on its vast territorial and trade network on which it could enjoy monopoly powers. The objective was to export manufactured products for the highest possible profits and import raw materials at the lowest possible prices.

Indeed, Great Britain's international trade rose significantly in the eighteenth and nineteenth centuries. Relatively slow growth until 1740 gave way to acceleration between 1740 and 1770 and explosion thereafter. While the population increased three-and-a half-times between 1700 and 1800, the volume of exports multiplied sevenfold, and re-exports tenfold. Growth was still rampant, but relatively less prominent in value as prices fell. Within the century, North America, the West and East Indies, and Africa became, by far, the main export markets for Great Britain, accounting for 70% of all exports at 13 million pounds sterling at the end of the century from less than about half a million pounds sterling at the beginning (Table 3.3). Raw materials and food items from the colonies and North America also became the major source (58%) of Britain's imports, a significant part of which was re-exported to Europe. Thus, by the end of the eighteenth century, Britain was an industrial trade giant importing large quantities of raw materials from colonies and exporting manufactured goods to colonies in addition to large amounts of re-exports to Europe.

Economic research has also confirmed that growth in trade, which was made possible by the colonization process, had a significant positive effect on the British economy's industrialization and overall growth. Growing

Table 3.3 Geographical composition of British international trade (pounds sterling)

	1700–1701 (England)	*1797–1798 (Great Britain)*	*Increase (times)*
Imports from	5,820,000	23,900,000	4.1
Ireland	291,000	3,107,000	10.7
Europe	3,608,400	6,931,000	1.9
North America	349,200	1,673,000	4.8
West Indies	814,800	5,975,000	7.3
East Indies and elsewhere	814,800	6,214,000	7.6
Exports to	4,460,000	18,300,000	4.1
Ireland	133,800	1,647,000	12.3
Europe	3,657,200	3,843,000	1.1
North America	267,600	5,856,000	21.9
West Indies	223,000	4,575,000	20.5
East Indies and elsewhere	178,400	2,196,000	12.3
Re-exports to	2,140,000	11,800,000	5.5
Ireland	149,800	1,298,000	8.7
Europe	1,647,800	9,204,000	5.6
North America	107,000	354,000	3.3
West Indies	128,400	472,000	3.7
East Indies and elsewhere	85,600	472,000	5.5

Source: Author's calculations based on data from Thomas and McCloskey (1981: 91), Table 5.1

exports of manufactured goods and imports of raw materials led to an increase in the share of manufacturing (and an ensuing fall in the share of agriculture) in total output, and Britain thus became an industrialized nation. As with the shifting importance of manufacturing and agriculture, the share of landowners in total income decreased, while that of workers increased.[7]

3.3 British Industrial Policies as the Driver of British Industrialization

It was not pure luck that the Industrial Revolution first occurred in Great Britain. There had been English attempts to develop the economy since at least the thirteenth century, in particular by supporting manufacturers and their exports. These policies can be classified as early versions of what today is called industrial policy consisting of technology transfer and trade policy measures. They especially targeted two industries—textiles and shipbuilding—which formed the basis of British economic supremacy after the seventeenth century.

Obviously, British industrial policy did not emerge as something coherent and well planned. Instead, it was an amalgam of policy decisions taken by different governments at different times with some reversals. When the effects are combined, however, they cleared the way for (if not deterministically caused) the UK to give birth to the first Industrial Revolution the world had seen.

These policies first helped develop certain manufacturing industries. They then presented a large, international, captive colonial market for manufactured products from the British industries, which imported at monopoly (and controlled) prices (Fig. 3.1). The rest of this section focuses on some of these well-known policies in British history.

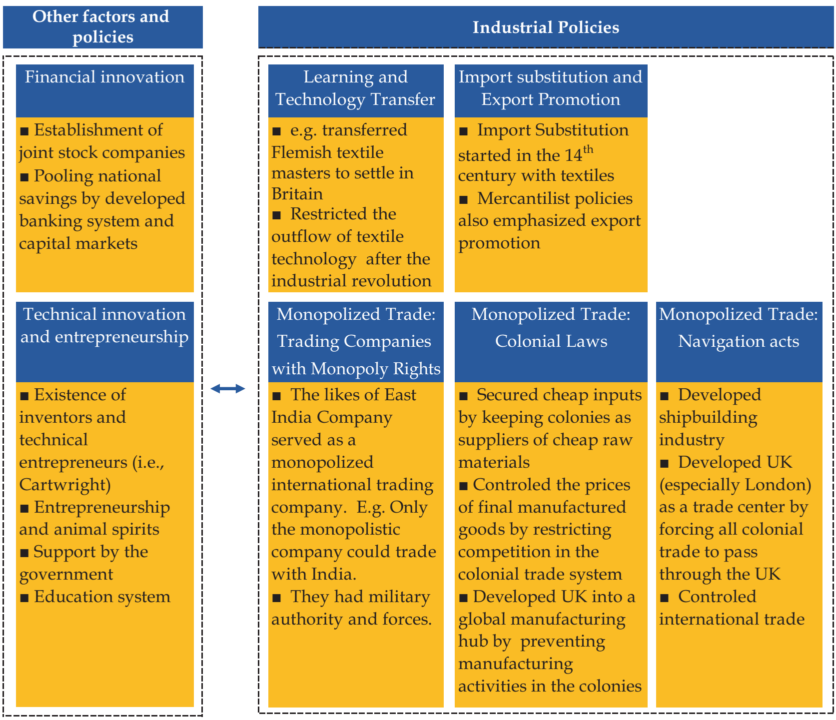

Fig. 3.1 British industrial policy

Inviting Textile Masters to Britain: Learning and Technology Transfer Before the Industrial Revolution

England was at best an underdeveloped country by the thirteenth century. Its economy was based on the production of wool and extraction of some minerals such as lead and tin. Raw wool comprised its main export item and it imported manufactured textiles.

Rather than by accident, the development of English woollen textiles industry in the following centuries owes a lot to early versions of an industrial policy consisting of inward technology transfer made possible by invitation of Flemish weavers. It started during the reign of Henry III (1216–1272) and gained a stimulus during that of Edward III (1327–1377).[8]

Edward III preferred manufactured textiles to production (and export) of raw wool. He can be considered the father of industrial policy in England, as he ran a quite deliberate policy to industrialize England. He provided special protection to clothmakers in Flanders (such as John Kemp and John de Bruyn, 'burgess of Ghent') or dyers (such as Nicholas Appelman), who decided to move to England. In 1352, a general proclamation was made that foreign clothmakers were not to be interfered with or compelled to join any guild. Edward III "sent Thomas de Kenelyngworth to bring John Belle and other clothworkers to England" in 1337.[9] He also identified locations suited to wool manufacturing; an interesting activity for a monarch[10]:

> In the reign of Edward III, it was evident that there was something wrong with the English cloth trade, and it was fortunate that the king's foreign policy gave the key to the solution of the industrial difficulties. Edward wished to damage the trade of Flanders and to that end did his best to hinder the export of wool and to revivify the English cloth trade so as to be independent of Flanders. Either in order to remedy the defects of the native cloth or with the deliberate intention of building up a cloth-making industry to compete with Flanders, he now adopted the policy of encouraging foreign experts to settle in the country. The conditions of the time were exceedingly favourable, for conditions in the Low Countries were very disturbed; the craftsmen in the Flemish towns were oppressed by the merchant companies, and, moreover, there was hostility between the weavers of the towns and those of the country districts, so that the latter were frequently deprived of their wool supply. Emigration to England would entirely solve this difficulty.[11]

British rulers continued to encourage the transfer of technical know-how and the immigration of Flemish weavers continued in the fifteenth and sixteenth centuries. No less than 1738 were naturalized in 1436 alone. In the fifteenth and early sixteenth centuries Scotland received many migrants (e.g. families with names such as Brabanters). In the remainder of the sixteenth and seventeenth centuries the migration continued after Spanish religious persecution in the Netherlands. They contributed significantly to the woollens, worsteds, serges, and bays, and caused a rapid development of production and exports[12]:

> A beginning can be traced to the immigration of 406 persons, driven out of Flanders in 1561, some of whom settled at Sandwich and Canterbury, while 30 families settled at Norwich, a town which was still suffering from the consequences of Kett's rebellion. The most important centre, however, was Colchester; for this was an industrially organized colony manufacturing the fine cloth known as bays, sackcloth, needles, and parchment. This Flemish colony appears to have flourished on the whole; James I continued their privileges and they were protected in the exercise and the regulation of their trades, so that the manufacture of bays continued to be important and the cloth which they produced an important article of export. Their trade began to decline in the 18th century under the competition of imported cotton fabrics.
>
> It is highly probable that cotton weaving was also started by these refugees. This had been a flourishing industry at Antwerp, a port where the necessary materials were easily procurable from Egypt. The beginnings in England are very obscure; but it is significant that it began to attract attention as an important trade in Manchester in the early part of the 17th century and that the rise of the manufacture in Lancashire appears to follow very closely on its decline at Antwerp. There is at least the considerable possibility of ascribing the development to the immigration of refugees. After the sack of Antwerp in 1585 we know that many of the inhabitants fled to England, and the same period marks a great growth in the population of Manchester.[13]

The contributions of the migrants were not limited only to weaving and included other important areas such as dyeing:

> There were many attempts in the 17th century to improve the art of dyeing in England; in 1643, a dye house was started at Bow by a Dutchman, Kepler, whose scarlet dye soon had a high reputation; in 1667 it was further

> improved by Bauer, a man of Flemish origin, and thenceforward there was no real necessity to export undyed cloth. There was still room for improvement in West Country weaving, and Paul Methuen and Willem Brewer brought over Dutch families to Dutch Barton, near Bradford-on-Avon, Wiltshire.[14]

England was not alone in trying to attract Flemish textilers; Scotland encouraged and received them at least from the twelfth century. In 1587, even the Scottish Parliament took a role and passed a law to attract Flemish weavers to Scotland.

Import Substitution and Infant Industry in the Fourteenth Century: Shifting England's Exports from Raw Wool to Textiles

In the thirteenth and fourteenth centuries, clothmaking flourished in Florence and Flanders (in towns like Bruges). British aristocracy active in agriculture turned their attention to sheep production. Encouraged by the Dukes of Burgundy, Flemish luxury clothmaking industry reached its "golden age" in the fourteenth and fifteenth centuries. Florentine and Burgundian textile products spread to Europe, helping the Flemish textile industry to flourish.

As clothmaking was of primitive quality in Britain, the country was a raw material exporter. In turn, Florentines and the Flemings manufactured and exported fine woollen cloth made from British raw wool. Consequently, British raw wool made livelihoods for not only the British aristocracy but also the Florentine and Flemish textile manufacturers. Britain imported some of the luxury Flemish and Florentine textiles. Thus, the raw wool was recycled to Britain, with Flemings and Italians earning significant value added for themselves.

In 1275, the British crown imposed the 'Great Custom'; exports of raw wool were taxed. This was probably more a fiscally oriented policy. Edward III's industrial policies in the fourteenth century aimed at developing the woollen textile production and turned England from an exporter of raw wool and importer of woollen textiles into a manufacturer and exporter of woollen textiles. To achieve that, he taxed and prohibited raw wool exports to Flanders and also taxed imports of woollen cloth. That was in addition to his policies encouraging emigration of skilled Flemish weavers to England, as mentioned above[15]:

> Soon after the start of his personal rule, in 1330, the English king Edward III reinvigorated his father's campaign for the promotion of a native textile industry. Every man or woman in the realm was allowed to produce cloth, no foreign textiles were to be imported except for the royal family, the nobility or the rich, and suitable franchises would be conceded to all alien cloth-workers wishing to establish themselves in England.[16]

Edward III and his industrial policy are described lucidly also by C.R.L. Fletcher and Rudyard Kipling (1911: 102):

> England at the end of the thirteenth century was the greatest wool-growing country in the world. We die not yet know how to weave fine cloth, so our wool was exported to Flanders. The Parliament said that every sack sent there should pay the King 6.8. The "Flemings" (men of Flanders) wove the cloth and sent it all over Europe. This trade made it more important than ever for our kings to keep the sea clear if pirates, and Edward worked hard at this task.

Edward III granted the monopoly of wool exports to a small group of merchants, effectively putting out of business Italian and other foreign merchants who had dominated the wool export trade.[17] Combined, his policies led to a fall in raw wool prices in England (as the monopoly merchants pressed the domestic prices down) but a rise in the export markets (as the merchants commanded higher prices from buyers). The result was a rapid development of the domestic clothmaking industry:

> English cloth-makers could now benefit from their artificially lower prices of wool in England, coupled with the artificially high prices of wool abroad. Once again, the market managed to get a leg up in its unending, zigzag struggle with power. By the mid-15th century, fine, expensive broadcloth 'woollen' were being produced abundantly in England, centring in the West Country, where swift rivers made water plentiful for fulling the woven cloth, and where Bristol could serve as the major port of export and entry.[18]

In this context, Edward's move seems a strategic one, combining trade policy with industrial policy in aiming to develop a local textile industry. There is no doubt that it was effective and bore fruits in the centuries to come; Britain gained strength in the textile industry before the Industrial Revolution by turning away from a raw-material-producing economy to a manufacturing one. The ban on export of raw wool and import of textiles was also effective in persuading Flemish weavers to move to England. Thus, the simultaneous policy of trade restrictions and attracting Flemish technical skills and investment turned out to be well-coordinated one.

The government's grip on the wool sector further strengthened in the fifteenth and sixteenth centuries. In 1552, customs duties on cloth imports were raised, thereby further strengthening the domestic clothmakers. Henry VII further increased taxes on exports of raw wool and even temporarily banned its export. His son Henry VIII continued the same policies of penalizing the exports of raw and semi-finished fabrics.[19] In 1564, Queen Elizabeth strengthened the government's grip on the trading firms. Manufacturers of linen, gunpowder, and non-woollen textiles in Britain were also supported by the policies to allow them to compete with foreign manufacturers.[20]

British Navigation Acts: Development of British Shipping and Shipbuilding Industries

In the fourteenth century the English merchant fleet was meagre; "[f]oreign merchants had to pay the King something for leave to come to sell and buy, for, as yet, there were very few English merchant-ships."[21] England enacted its first "Navigation Act" (though it was not called so at the time) in 1381 under the reign of Richard II:

> [N]one of the King's liege people should ship any merchandise out of or into the realm except in the ships of the King's liegeance, on pain of forfeiture.[22]

The act aimed at supporting the English shipping and the shipbuilding industries by restricting the carrying of English imports and exports to English ships. While this first Navigation Act remained ineffective, 500 years later, in 1785, future American President John Adams was inspired by Richard II's Navigation Act as a tool to develop America's shipbuilding industry:

> What shall we do to defend ourselves? Shall we confine the exportation of the produce of the United States to the ships and mariners of the United States? To increase the English navy, the statute of the Richard II. enacted that "none of the King's liege people should ship any merchandise out of, or into the realm, but only in the ships of the King's liegeance, on pain of

> forfeiture." If the United States were able and willing to imitate this statute, and confine all our exports and imports to ships built in the United States, and navigated with American seamen, or three quarters American seamen, or one half, or even one third American seamen, what would be the consequence? We should not have at first enough either of ships or seamen to export the produce, and import what would be wanted from abroad; but we should see multitudes of people instantly employed in building ships, and multitudes of others immediately becoming sailors, and the time would not be long before we should have enough of both. The people of the United States have shown themselves capable of great exertions, and possessed of patience, courage, and perseverance, and willing to make large sacrifices to the general interest.[23]

Similar laws were also enacted under Edward IV in 1463 and under Henry V, who "devoted himself to the improvement of English ships in imitation of the large vessels of the Genoese."[24] During his time shipbuilders were encouraged and supported.[25] Three large British ships were built in the Southampton docks.[26] Cunningham (1892: 414) remarks that "these improvements in shipbuilding enabled Englishmen to send out fleets that were fit to be employed in voyages of discovery" in the sixteenth century.

Similar Navigation Acts were also enacted during the reigns of Henry VII (1485–1509), Henry VIII (1509–1547), and Elizabeth I (1558–1603).[27] But the most forceful ones came during the years 1651–1663 and remained in force until 1849. These last rounds of acts aimed at shaping Britain's colonial trade in order to increase the benefits from Britain's growing colonies and to strengthen British manufacturing. Imports to Britain and the colonies from Asia and Africa had to be carried by British ships.

Monopolizing the International Trade of Colonies: Running Current Account Surpluses by Prohibiting Manufacturing in the Colonies

Thomas Mun, a merchant and a Director of East India Company, believed that in order to prosper, Great Britain would have to trade internationally, with its exports exceeding its imports. He had written in 1664 that (original text)

> the ordinary means therefore to increase our wealth and treasure is by Foreign Trade, wherein we must ever observe this rule; to sell more to strangers yearly than we consume of theirs in value.[28]

That was British mercantilism. But it was also what the Portuguese, in effect, had been trying to do from the fifteenth century, although with a significantly higher rate of pillaging than trade. Trade (and current account) deficit has proved to be a time-independent driver of policies and economic decisions in a resource-poor economy. But all that was prior to the Industrial Revolution, which changed the whole game. The basic principle of running a trade surplus in the Industrial Revolution required policies to develop manufactured goods.

If the British colonial ('mercantile') system is one evidence of that, others can be seen elsewhere. In the nineteenth-century Meiji Japan or twenty-first-century China, maintaining the current account in surplus continues to be as relevant to the shaping of policies as in the fifteenth-century Portugal or seventeenth-to-nineteenth-century England. Likewise, the orientation of Colbert's seventeenth-century policies in France or Alexander Hamilton's in the eighteenth century in the USA was not much different.

Colonial laws reflected Britain's desire that the colonies did not establish manufacturing industries and had to import manufactured goods from Britain.[29] The well-known ones were the Woollens Act (1699), the Hat Act (1732), and the Iron Act (1750).[30] The Woollens Act restricted the export of wool and production of woollen textiles in the colonies to support their production in Britain. The Hat Act—which Thomas Jefferson later characterized as a 'despotic'—restricted the manufacturing and exports of hats in the colonies. The Iron Act abolished the duties on exports of pig iron (an intermediate product) to Britain from the colonies but prohibited the colonies from manufacturing finished iron products. There were other laws to impede the development of important manufactured goods such as rum, which at one point was done in 20 distilleries in New Port alone; the distillation of rum in the colonies from sugar molasses obtained from West Indies was penalized heavily by an act in 1733.[31] All this effectively aimed at keeping the colonies as providers of raw materials and the motherland as the manufacturing basis.

Effectively, the navigation and colonial acts created a restrictive trade system in which the colonies were to export raw materials only to motherland Britain, which, lying at the centre of the system, was to process the inputs and export the manufactured goods back to the colonies. This was made possible by the companies which were granted monopoly trading rights by virtue of their royal charters—the British East India Company stood as the prime example. From the colonies, the raw materials were thus procured at sub-market prices and end-products sold at dictated prices, imposing a wealth transfer from the colony to Britain. Likewise, sales of manufactured goods also benefited from the monopoly power of the British.

In the process, Britain's manufacturing industry and international trade flourished. Its West Indies and North American colonies also prospered as colonizers tapped the virtually unlimited agricultural and natural resources of the new territories. Post-industrial Britain was a nation importing raw and semi-finished goods and exporting manufactured goods.[32] The trend accelerated further in the nineteenth century when the free trade ideology peaked and became a tool of British international policy once the country's industrialization progressed. In the first half of 1840, after Britain made a decision to shift to a unilateral freeing of trade,[33] it forced other nations to open up uncolonized countries to trade through free trade agreements forced by wars or gunboat diplomacy. While wars and conflict caused intermittent falls and stagnation, between 1800 and 1880 British exports increased by more than 20-fold[34] on the back of manufactured goods and global control of trade routes and the colonial system.

The Triangular Trade

In addition to the prime commodities of tobacco, sugar, and Indian textiles, slaves and Newfoundland fish were the main items of British foreign trade in the Atlantic during the second half of the seventeenth century. British ships collected the Newfoundland fish and sold them in the Mediterranean or the West Indies; they also abducted people from West African coasts (against small amounts of goods that the ships carried from England) and sold them as slaves in North America.[35] The ships then took American raw material such as tobacco to England, forming a quite efficient trade cycle. That formed the seed of the British triangular trade in the Atlantic, which was to expand in the subsequent century (Fig. 3.2).

In the second half of the seventeenth century, England's move to become an international commercial and military power gained impetus. Now the situation was different in that England possessed a critical mass of colonial territories in the West Indies and North America and, to some degree, in East Asia. To strengthen its economic grasp on the colonies, England (and subsequently Britain) forcefully regulated its commercial relations, starting in 1645.

As all roads opened to Rome in the Roman Empire, the so-called Navigation Acts ultimately aimed at making Britain the centre of all foreign

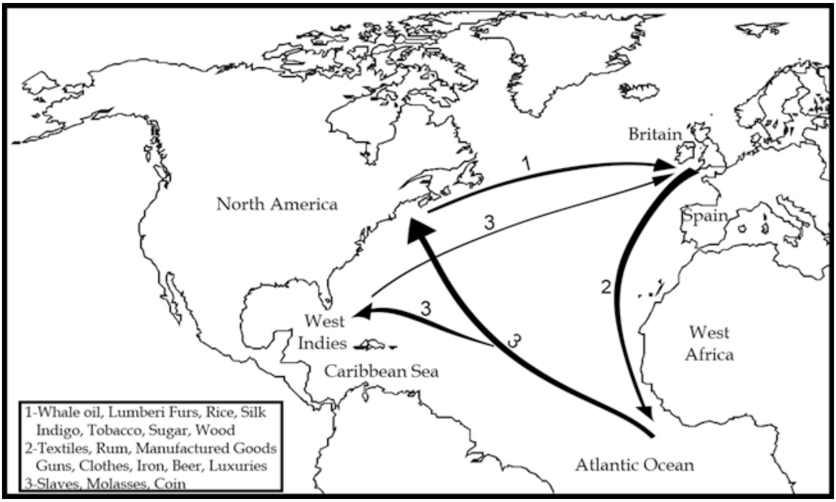

Fig. 3.2 A simple exposition of British triangular trade

trade with Britain's colonies and extracted as much economic value as possible from Britain's colonies. This was made possible by requiring that all the important products of the colonies could only be exported to the motherland Britain, and that non-British products could also only be imported to the colonies through England. Secondly, as in the earlier acts under the reign of Richard II, Henry VII, and Elizabeth, the laws required that all export trade was to be carried on British ships.

3.4 India Before and After British Invasion

During the initial phases of British trade with India, the Indian economy was more sophisticated than the British. There was British demand for Indian products, but on the Indian side, demand for British goods such as wool, tin, lead, or quicksilver was mostly non-existent.[36] Before Plassey, Britain ran a trade deficit with India[37]; Alexander Dow (1773) saw no hope that the Bengali gold and silver would flow back. The East India Company had been increasingly shipping Indian calico fabrics and Bengali muslins from Calcutta to London and this led to the British Parliament's 'Calico Laws,' which imposed duties on imports from the Indian subcontinent.

Chaudhuri (1974: 127) remarks that "before the discovery of machine spinning and weaving in Britain in the second half of the eighteenth century, the Indian subcontinent was probably the world's greatest producer of cotton textiles." In 1772, during the first phase of Britain's full sovereignty over the whole of India, a British economist and government officer, Henry Patullo (1772: 25) wrote[38]:

> Bengal could claim confidently that the demand for its textile manufactures could never lessen because no other nation on the globe could either equal or rival their quality.

That quickly changed after the British rule in India and the Industrial Revolution. India was now a supplier of raw cotton to Britain and an importer of manufactured cotton textiles and other products. Maddison (1971) notes

> massive imports of cheap textiles from England after the Napoleonic wars. In the period 1896–1913, imported piece goods supplied about 60 per cent of Indian cloth consumption and the proportion was probably higher for most of the nineteenth century.

On similar lines, a British journalist bluntly explained India's de-industrialization at the hands of the British:

> For at least two centuries the handloom weavers of Bengal produced some of the world's most desirable fabrics, especially the fine muslins, light as "woven air", that were in such demand for dressmaking and so cheap that Britain's own cloth manufacturers conspired to cut off the fingers of Bengali weavers and break their looms. Their import was ended, however, by the imposition of duties and a flood of cheap fabric – cheaper even than poorly paid Bengali artisans could provide – from the new steam mills of northern England and lowland Scotland that conquered the Indian as well the British market. India still grew cotton, but Bengal no longer spun or wove much of it. Weavers became beggars, while the population of Dhaka, which was once the great centre of muslin production, fell from several hundred thousand in 1760 to about 50,000 by the 1820s. … Subsequently, India became the exporter of raw materials and foodstuffs – raw cotton and jute, coal, opium, rice, spice and tea – rather than manufactured goods.

After the British invasion, life in India was never like the same. Perhaps the main economic casualty was the Indian textile industry. As Britain industrialized, the Jewel in the Crown de-industrialized and was relegated to being a supplier of raw materials produced at slave wages. India's agricultural production pattern changed to its detriment. It lost its profitable exports by free merchants. Instead it turned to controlled exports of what the British preferred and extracted profits, with little or no profit to locals. Controls meant that the types of goods and their prices were commanded by the British East India Company.

It is a common belief in India that the British East India Company had the thumb and index fingers of the master weavers in Bengal chopped off so that they could not weave their world-famous muslins and other fabrics.[39] Another similar belief is that the Company also destroyed many hand looms. In any case the access of the local weavers to cotton was no longer possible, as the East India Company shipped them to Britain. The wages of the Indian labourers producing raw exportable goods, especially cotton, for the Company were also controlled at subsistence levels:

> The city of men had become a city of animals. Weavers' dwellings were overgrown, the thatch alive with birds, snakes and insects, while roussettes – bats small and multi-coloured as butterflies – flew in and out of earth-mounds that had been homes; hunched vultures surveyed tracts of land in which the human voice was stilled. People lost the skill of their fingers, and only the roughest-made country cloth still found a market among the poorest.[40]

After the invasion of Bengal and subsequently the Indian subcontinent, Chinese tea (as well as that produced in the East India Company plantations of Bengal in the nineteenth century) became a prime commodity of trade for the East India Company. In the five years following 1768, the East India Company's tea shipments tripled.[41] By mid-nineteenth century per capita tea consumption in Great Britain reached two pounds per annum.

The British Treasury aimed at maximizing proceeds from India. The British Parliament imposed taxes even on animal manure, which was used by farmers as fertilizer. The existing agricultural production patterns were quickly transformed into export crops (primarily cotton) and some railways were built in order to carry the products to the ports.

This change in agricultural patterns brought a far worse outcome to the Indian continent. As exports of the cash crops and grain continued, famines killed millions locally.[42] Over 60 million deaths were caused by famines followed by infectious diseases (such as bubonic plague and influenza), whose spread was helped by the railway infrastructure.[43] All this led to a significant slowdown of the population growth.[44] This was in addition to massacres—especially following rebellions to British rule such as the *Great Mutiny* in 1857. Well-known famines in the continent started with the Bengal Famine in 1870, in which one-third of Bengal's population died.[45] Other major famines occurred in 1783–1784 (the Chalisa Famine), 1791–1792 (Doji Bara Famine), 1860–1861 (Upper Doab Famine), 1866 (Orissa Famine), 1869 (Rajputana Famine), 1868–1870 ("Central Indian Famine"), 1876–1878 (the Great Famine), 1896–1902, and 1943–1944.[46]

Britain's role in famines in India lasted until the end of its rule. During the Second World War, Prime Minister Winston Churchill caused a major famine, leading to 5–7 million deaths (under different estimations) in what was later to be called the Bengali Famine or Holocaust.[47] Nobel Laureate Amartya Sen's research showed clearly that this was a man-made famine caused by the British government's policy. Churchill later defended the decision; the food materials that were carried from India to Britain were strategic to the latter, although it caused so many deaths in India. He is quoted to have said that the Indians were a "foul race protected by their mere pullulation [rapid breeding] from the doom that is their due."[48]

Manufacturing 'Good' Indians

In the nineteenth century, Thomas B. Macaulay, a leading British politician who served as British Secretary of War, championed the strategy to integrate the Indian continent with the British Empire through British education. The strategy was built on psychologically subjugating the continent that was already subjugated militarily at the time. He was cognizant of the fact that it was very difficult and costly to control such a large continent by military force in the long term. Instead, the Indians would have to be convinced that it was to their benefit to voluntarily attach to the British Empire. He thus remarked:

> It is scarcely possible to calculate the benefits which we might derive from the diffusion of European civilisation among the vast population of the East. It would be, on the most selfish view of the case, far better for us that the people of India were well-governed and independent of us, than ill-governed and subject to us; that they were ruled by their own kings, but wearing our broadcloth, and working with our cutlery, than that they were performing their salams to English collectors and English magistrates, but were too ignorant to value, or too poor to buy, English manufactures. To trade with civilised men is infinitely more profitable than to govern savages. That would, indeed, be a doting wisdom, which, in order that India might remain a dependency, would make it a useless and costly dependency, which would keep a hundred millions of men from being our customers in order that they might continue to be our slaves.[49]

Macaulay was blunt on his ideas of the supremacy of the British language and culture over Indian and he did not see much value in the latter. Thus, he considered the British were providing a valuable service to the continent:

> The whole question seems to me to be, which language is the best worth knowing? I have no knowledge of either Sanscrit or Arabic. But I have done what I could to form a correct estimate of their value. I have read translations of the most celebrated Arabic and Sanscrit works. … I have never found one among them who could deny that a single shelf of a good European library was worth the whole native literature of India and Arabia. The intrinsic superiority of the Western literature is, indeed, fully admitted by those members of the Committee who support the Oriental plan of education.
>
> It will hardly be disputed, I suppose, that the department of literature in which the Eastern writers stand highest is poetry. And I certainly never met with any Orientalist who ventured to maintain that the Arabic and Sanscrit poetry could be compared to that of the great European nations. But when we pass from works of imagination to works in which facts are recorded, and general principles investigated, the superiority of the Europeans becomes absolutely immeasurable. It is, I believe, no exaggeration to say, that all the historical information which has been collected from all the books written in the Sanscrit language is less valuable than what may be found in the most paltry abridgements used at preparatory schools in England. In every branch of physical or moral philosophy, the relative position of the two nations is nearly the same.

> Whoever knows [the English] language has ready access to all the vast intellectual wealth, which all the wisest nations of the earth have created and hoarded in the course of ninety generations. It may safely be said, that the literature now extant in that language is of far greater value than all the literature which three hundred years ago was extant in all the languages of the world together. Nor is this all. In India, English is the language spoken by the ruling class. It is spoken by the higher class of natives at the seats of Government. It is likely to become the language of commerce throughout the seas of the East. It is the language of two great European communities which are rising, the one in the south of Africa, the other in Australasia; communities which are every year becoming more important, and more closely connected with our Indian empire. Whether we look at the intrinsic value of our literature, or at the particular situation of this country, we shall see the strongest reason to think that, of all foreign tongues, the English tongue is that which would be the most useful to our native subjects.[50]

And he was a pragmatist when it came to attaining results with his strategy. He proposed to educate an elite class who would cherish the superiority of the British culture and become a bridge between London and millions of impoverished and "uneducated" Indians:

> We must at present do our best to form a class who may be interpreters between us and the millions whom we govern; a class of persons, Indian in blood and colour, but English in taste, in opinions, in morals, and in intellect. To that class we may leave it to refine the vernacular dialects of the country, to enrich those dialects with terms of science borrowed from the Western nomenclature, and to render them by degrees fit vehicles for conveying knowledge to the great mass of the population.[51]

In short, British rule was devastating to the Indian continent. India lost much of its economy, its lives in millions, and its dignity under the British rule.

3.5 The Story of Cotton: Slaves, India, and British Industrial Revolution

> Without cotton, you have no modern industry…Without slavery, you have no cotton. (Karl Marx)

For North and South America and India, whose fates were closely linked to British colonial expansion and the Industrial Revolution, cotton became one of the most important commodities as the Industrial

Revolution proceeded.[52] It may not be an exaggeration to say that cotton played a similar, albeit smaller, role to oil in the twentieth century in the shaping of commercial and political geography.

Consumption of cotton textiles in Europe has been a relatively recent phenomenon. In the Iberian Peninsula, in addition to the development of a high civilization, Muslim conquest in the eighth century led to what could be called the first versions of the concept of fashion and both the production and usage of cotton textiles. But it had not spread further into Europe[53] except for some penetration into Italy.

Unlike wool, cotton could not be produced in Britain for climatic reasons. Prior to the Industrial Revolution, British textile production was mostly based on wool and, to some extent, on linen. In pre-industrialized Britain, manufacturing of cotton textiles was miniscule, while consumption of cotton textiles was considered somewhat of a luxury, although its price could be lower than certain woollen and linen products. In the sixteenth century cotton textiles imported from India started to make inroads into the British market. The East India Company lobbied for permission to import 'Calicoes' (dyed or printed cotton fabrics that could be used for clothing and home textiles). The name came from the Indian city of Calicut. The Company allegedly contributed £325,000 to the crown to assist the decision process between 1660 and 1683.

Massive cotton agriculture was introduced in the late eighteenth century first in the West Indies and then North America. That led to a second wave of slave importation to the land-rich and labour-scarce country. In the nineteenth century, from being a country which would have become a major importer (by the East India Company) of cotton fabrics from India, Great Britain had turned itself into the largest manufacturer and exporter of cotton fabrics globally following the Industrial Revolution. In the process, the USA became the main exporter of raw cotton to Great Britain.

Banning Imports of Efficient Indian Cotton Textiles

The consumption of cotton textiles in the island grew slowly but surely. Resistance to cotton also mounted. On the one side was the objection of the 'moralists,' who advocated that imports from India would corrupt the moral values of English society. But more importantly, there was increasing pressure on British lawmakers from wool, linen, and silk fabric manufacturers, who were against the imports of Calicoes; cotton stole from their market share. The 'pamphleteers' argued that there was no way the

British textile manufacturers could compete with the Indian textiles. That gave way to the 'Calico Laws' in 1702, which prohibited imports of Indian textiles into Britain.

As the first law was inadequate in stopping the inflow of Calicoes, a second act was passed in 1721. Calicoes were not the only textile product banned in Britain; imports of French silk products had been banned earlier, in 1688. Nor was Britain alone in the protection of the local textile industry; the French had banned Calico imports earlier in 1686 just after the death of Colbert.

The opposition against cotton was fierce. Women were attacked, had acid thrown on their clothes, or they were stripped naked as they wore the 'forbidden cloth.'[54] However, the British view (of consumers, important businessmen, and the government) of cotton and cotton textiles changed drastically in the second half of the eighteenth century.

Turning Britain into a Cotton Textiles Manufacturer

Nevertheless, the demand of the population for the consumption of cotton textiles grew rapidly[55] given the advantages of cotton over wool, silk, and linen. A large pent-up demand occurred, leading to booming sales and cotton textiles became a fad for quite a while. Physical characteristics of cotton also played a role; though wool was more durable, cotton fabrics could carry a wide set of fashionable and exotic colours (unlike linen) and could be washed easier and many times more before the colours faded away.[56]

More importantly, a series of technological advances by British inventors and textile manufacturers made Britain the possessor of the most efficient cotton textile production technology. British authorities tried to guard the technology jealously by prohibiting the workers, masters, and industrialists of the sector to leave the country.

By the new proprietary textile technologies and increasing demand for cotton, Britain achieved something that even Edward III would have envied. Instead of importing cotton fabrics from India (which was banned anyway), it would import raw cotton from India and elsewhere and manufacture and export dyed cotton fabrics and apparel. This expansion of the cotton textile industry played a key role in Britain's Industrial Revolution. Soon, in the nineteenth century, Britain became the largest procurer of cotton and producer of cotton textiles in the world.

USA Becomes the Source of Raw Cotton

Earlier, the smaller British cotton industry largely depended on imported Ottoman cotton dispatched from the Aegean ports of Thessaloniki and Izmir. In the 50 years between 1784 and 1834, Britain's cotton imports increased eight times from £1.8 million to £14.5 million.[57] Rapidly growing demand soon required much bigger quantities of cotton than the Ottoman Empire could meet due to shortages of suitable agricultural land as well as labour even after the emigration of thousands of Greek labourers to Anatolia.[58] This gave way to a severe quest for raw cotton imports by British industry.

The first respondents were the West Indies, where production and shipment to Britain exploded in the last quarter of the eighteenth century. Soon, however, the inelastic supply was evident when imports from Portuguese South American suppliers took over and met the excess demand.[59] Together, the two shortly became the main cotton suppliers to the growing British textile industry. The share of Ottoman cotton in British imports reduced to around 1% in 1810 from 20% in 1790.[60]

Shortly thereafter, the USA, which gained its independence in 1776, overtook South America and West Indies as the main exporter of cotton to Britain. Although there had been some colonial cotton production since the foundation of Jamestown, its amount was very small (much the same as was the situation for sugar production) and it was used for domestic textile production until the late eighteenth century[61] and no exports of cotton existed. That was why, in 1785, customs officials in Liverpool impounded a few bags of cotton that was unloaded from a ship from England's American colonies (at the time, already United States of America). To the customs officials, those bags were contraband West Indies products, as North America was believed to be unable to produce cotton.[62]

Those years were the outset of a major breakthrough for American agriculture. Founding fathers such as George Washington and James Madison as well as some businessmen were trying to attract the attention of American farmers to cotton, predicting that cotton production could help America prosper.[63] Another founding father, Alexander Hamilton, crusading for 'manufactures' advocated that America's future was not in agriculture but in the manufacturing industry.

Cotton production quickly boomed in states like Carolina and Georgia, starting in the late nineteenth century (Fig. 3.3). The climate and land were quite convenient. Farmers used their earlier experience and infrastructure

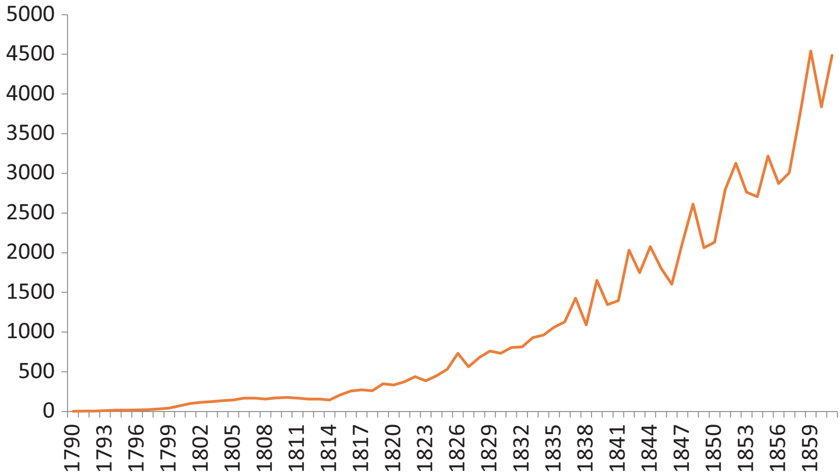

Fig. 3.3 Production of raw cotton in the USA (thousand bales)

with tobacco and rice production and tried new seeds from the Bahamas, replacing the traditional ones from Cyprus and Izmir that were introduced by the end of the seventeenth century.[64]

When a rebellion reduced the exports of the West Indies island of Saint Domingue—which at the time was the most important supplier of cotton to Europe— American cotton farmers received a golden opportunity to increase their production. They successfully tapped the potential; raw cotton production in the USA increased from 3315 bales in 1790 to 334,378 bales in 1820 and 4,485,893 bales in 1861 (Fig. 3.3) as exports to Britain surged. Quite rapidly, cotton became the primary and dominant export item of the USA (Fig. 3.4), representing 50–60% of total exports during the nineteenth century.[65] By 1860, the USA accounted for about half of the world's cotton production and 80% of cotton imports of Great Britain. Cotton remained the USA's most important export item until 1937.[66]

Cotton: The Critical Commodity

Some observers likened cotton of the time to oil of today; millions of jobs and tens of thousands of businesses in Great Britain depended on cotton produced in the southern states of America in the 1860s. Cotton was so important that when southern Confederates forced Great Britain to side

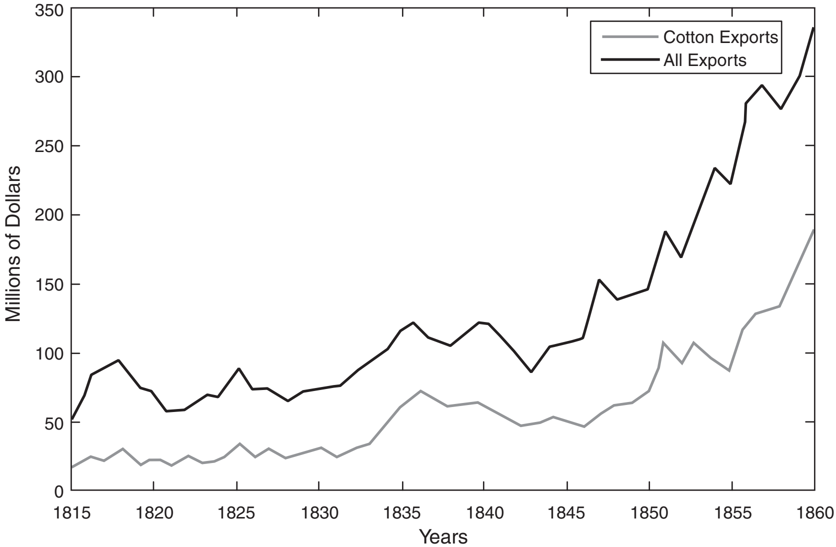

Fig. 3.4 Cotton becomes the main export item of USA. (Source: North 1961)

with them in the American civil war in 1861, they implemented the so-called King Cotton policy, which meant threatening the British textile industry in Lancashire to cut off slave-produced southern cotton exports. Likewise, cutting off exports to New England would damage its textile industry. Confederates passed laws to limit exports and even attempted to burn cotton bales to that effect. Ironically Lincoln's policy was also to prevent southern exports to Great Britain to damage its foe's economy:

> "No industry," Eric Hobsbawm writes, "could compare in importance with cotton in the first phase of British industrialization."
>
> The British were rightfully alarmed about their precarious dependency. Blackwood's Magazine in 1853 bemoaned the fate of "millions in every manufacturing country in Europe within the power of an oligarchy of planters."

British cotton textile innovations around the 1760s—by Kay, Arkwright, Hargreave, and others— and the reorganization of textile production around 'factories' made the island an efficient cotton textiles manufacturer. Consequently, the textile industry, exports, investments, and employment started to grow. The Calico Laws, which had been enacted to protect the local wool industry, were repealed in 1774. By then, the British, but more importantly the French and the Dutch, had also learned the technology of dyeing the cotton textiles, shaking the Indian (and Turkish) monopoly in the art through imitation and innovation.

For example, Georges Roques noted the following in his 333-page manuscript of 1678 of the production of textiles in Ahmedabad, Burhanpur, and Sironj[67]:

> There can be no doubt that it would be most harmful to the State were we to neglect our own production of light silken and woollen materials in favour of Persian and Indian cottons. It can, however, only be a good thing to know how these people set about applying the colours to their cotton cloths, which not only do not run or fade when washed but emerge more beautiful than before. Everyone can see for himself how useful this would be when he envisages what the possibilities could be for our cotton, linen and hemp cloth.

Cotton and Slavery

The explosion of cotton production in the Americas drove another trade; that of slavery. The second slavery wave was tremendous; the number of slaves sold in the Americas during the century after 1780 was almost equal to those sold during the three centuries between Columbus and that year.[68] In the French colony Saint Domingue alone, which provided 'coton des Isles' to French manufacturers, slaves of African origin constituted 90% of the total population by the turn of the eighteenth century. In total at least 19 million slaves were exported from Africa (Fig. 3.5).[69]

For 'efficiency' purposes, this slave trade was particularly brutal. To maximize profits, slaves were packed in hundreds in ships in thoroughly inhumane conditions. That caused a very high rate of mortality during the journeys, which set the tone for the often-brutal treatment inflicted upon them at their destination:

> The men on a slaver were ironed in pairs by the ankles, and men and women were compelled to lie down in their backs on the deck with their feet outward, the iron on men usually fastened to the deck. The space 'between decks' where they were confined was about 3 feet 10 inches high, and packed so close that a space of only 6 feet long and 10 inches high was allotted to each slave. In these quarters they remained while the human cargo

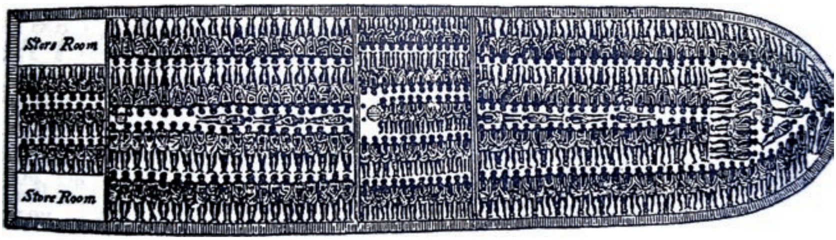

Fig. 3.5 The deck of a slave ship. (Source: Ludlow 1918: 139)

> was being collected (3–6 months) and during the passage across the Atlantic (6–10 weeks). In a tropical climate and under these conditions the mortality was frightful.[70]

3.6 Free Trade Agreements, Free Trade of Opium, and the Collapse of China

China was the next bountiful target of the British expansion after India; the weakened Chinese Empire's population at the time was more than 17 times that of Great Britain. At the end of the process, the Chinese political system and economy collapsed, and China became a state under chaos, controlled by Britain and other great forces of the time.

During its relatively peaceful eighteenth century, the Chinese economy flourished. The Chinese population reached 300 million at the end of the eighteenth century[71] from 150 million when the Qing dynasty took over in 1650. However, as population growth continued rapidly, reaching 430 million by mid-nineteenth century, the possibilities of the expansion of agricultural land was exhausted. The nineteenth century, consequently, was long and painful for China, marked by famines and rebellions. More importantly, the *Middle Kingdom* administratively weakened. That made China an easy target for British control.

Britain Extends Beyond India

At the beginning of the nineteenth century, Great Britain completed the incorporation of India as the jewel in its crown. But by the same time, it had lost its North American colonies and China appeared as another major market to expand to. India was located on the way to China. However, Britain had only one trading post on the sea routes from India to China, which was Bencoolen. In order to secure the route to China, British forces in India secured three trading posts in the Malay Archipelago, where the trade was dominated by the Dutch.

Earlier in 1786, the establishment of a British station in Penang was negotiated with the Sultan of Kedah. It would serve as a stopover for ships sailing from India to China. In fact, back in 1592, James Lancaster used Penang as a centre for his looting activities in the region for a few months.[72]

In 1795, Malacca was taken from the Dutch. Realizing that the Dutch domination in the Archipelago could not be broken without a strong trading post in the south, in 1819 Sir Stamford Raffles, who was the British Lieutenant-Governor in Bencoolen, picked out Singapore. The same year, he negotiated with the local rulers who were still under Dutch domination to set up a trading post on the island against payments to the rulers. That formed a formidable basis for the British takeover of the Archipelago's control and secured the route from India to China.

China and Britain

Trade between Western European countries and China started in 1684 when Emperor Kangxi abolished the earlier ban. However, under the 'Canton System' foreign merchants were allowed to use only four ports—including Canton (Guangzhou), a town located in South China, about 2000 kilometres from Beijing—and transactions in those ports were heavily regulated by the Chinese.

The British had been trying to trade with the Chinese Empire since the late sixteenth century, generally with failure. After the British East India Company had started to trade with China in 1684 (after securing a trading post in what is today Taiwan in 1672), two things became clear. Firstly, the Chinese found British goods inferior[73] and not interesting, while the British consumers' demand for Chinese goods (porcelains, silk textiles, and tea) grew. That is, Britain ran a trade deficit with China.

Secondly, their trading activity was under strict regulation and supervision by the powerful Chinese administration. The British were allowed to trade only through Canton. What, when, and where in Canton the *hongs* (foreign merchants) could buy, sell, and reside was closely monitored. The Chinese did not see significant benefit from trade with the British and were concerned that "the foreign traders, who were not always engaged in peaceful trading activities, would threaten domestic stability by inciting unrest, disorder, and promoting piracy."[74]

The British found this quite restrictive but could not resist it as long as the Chinese Empire was powerful. That is, until the first half of the nineteenth century. In response to a request for trade privileges by Lord Macartney, the representative of British King George III, Emperor Chiang Lung wrote him in 1793 refusing to remove the restrictions and grant permanent residence rights to British merchants in Beijing and elsewhere.[75]

Chiang Lung's administration was the last strong administration in China that could dictate its interest. It continued to hold the century-long Chinese imperial convictions: the Chinese culture was superior to that of the barbarian. The Chinese did not need the 'strange' things that the Europeans were trying to sell to China, as it had vast lands and production. However, China was ready to supply the barbarians with the necessities they had to import from China. Also, the barbarians' desire to open churches was unreasonable given the superior Chinese philosophy. Excerpts from the Emperor's letter below show how the Emperor positioned Chinese vis-à-vis the 'barbarians' from the 'remote, lonely island'[76]:

> As to your entreaty to send one of your nationals to be accredited to my Celestial Court and to be in control of your country's trade with China, this request is contrary to all usage of my dynasty and cannot possibly be entertained. It is true that Europeans, in the service of the dynasty, have been permitted to live at Peking, but they are compelled to adopt Chinese dress, they are strictly confined to their own precincts and are never permitted to return home. You are presumably familiar with our dynastic regulations. Your proposed Envoy to my Court could not be placed in a position similar to that of European officials in Peking who are forbidden to leave China, nor could he, on the other hand, be allowed liberty of movement and the privilege of corresponding with his own country; so that you would gain nothing by his residence in our midst.
>
> Moreover, our Celestial dynasty possesses vast territories, and tribute missions from the dependencies are provided for by the Department for Tributary States, which ministers to their wants and exercises strict control over their movements. It would be quite impossible to leave them to their own devices. Supposing that your Envoy should come to our Court, his language and national dress differ from that of our people, and there would be no place in which to bestow him. It may be suggested that he might imitate the Europeans permanently resident in Peking and adopt the dress and customs of China, but, it has never been our dynasty's wish to force people to do things unseemly and inconvenient. ...

The thing is utterly impracticable. How can our dynasty alter its whole procedure and system of etiquette, established for more than a century, in order to meet your individual views? …

If you assert that your reverence for Our Celestial dynasty fills you with a desire to acquire our civilisation, our ceremonies and code of laws differ so completely from your own that, even if your Envoy were able to acquire the rudiments of our civilisation, you could not possibly transplant our manners and customs to your alien soil. Therefore, however adept the Envoy might become, nothing would be gained thereby.

Swaying the wide world, I have but one aim in view, namely, to maintain a perfect governance and to fulfil the duties of the State: strange and costly objects do not interest me. As your Ambassador can see for himself, we possess all things. I set no value on objects strange or ingenious, and have no use for your country's manufactures.

Yesterday your Ambassador petitioned my Ministers to memorialise me regarding your trade with China, but his proposal is not consistent with our dynastic usage and cannot be entertained. Hitherto, all European nations, including your own country's barbarian merchants, have carried on their trade with our Celestial Empire at Canton. Such has been the procedure for many years, although our Celestial Empire possesses all things in prolific abundance and lacks no product within its own borders. There was therefore no need to import the manufactures of outside barbarians in exchange for our own produce. But as the tea, silk and porcelain which the Celestial Empire produces, are absolute necessities to European nations and to yourselves, we have permitted, as a signal mark of favour, that foreign hongs [merchants] should be established at Canton, so that your wants might be supplied and your country thus participate in our beneficence.

Nevertheless, I do not forget the lonely remoteness of your island, cut off from the world by intervening wastes of sea, nor do I overlook your excusable ignorance of the usages of our Celestial Empire. I have consequently commanded my Ministers to enlighten your Ambassador on the subject, and have ordered the departure of the mission. But I have doubts that, after your Envoy's return he may fail to acquaint you with my view in detail or that he may be lacking in lucidity, so that I shall now proceed … to issue my mandate on each question separately. In this way you will, I trust, comprehend my meaning.…

Your request for a small island near Chusan, where your merchants may reside and goods be warehoused, arises from your desire to develop trade. As there are neither foreign hongs nor interpreters in or near Chusan, where none of your ships have ever called, such an island would be utterly useless for your purposes. Every inch of the territory of our Empire is marked on the map and the strictest vigilance is exercised over it all: even tiny islets and far lying sandbanks are clearly defined as part of the provinces to which they belong. Consider, moreover, that England is not the only barbarian land which wishes to establish … trade with our Empire: supposing that other nations were all to imitate your evil example and beseech me to present them each and all with a site for trading purposes, how could I possibly comply? This also is a flagrant infringement of the usage of my Empire and cannot possibly be entertained. …

The next request, for a small site in the vicinity of Canton city, where your barbarian merchants may lodge or, alternatively, that there be no longer any restrictions over their movements at Aomen, has arisen from the following causes. Hitherto, the barbarian merchants of Europe have had a definite locality assigned to them at Aomen for residence and trade, and have been forbidden to encroach an inch beyond the limits assigned to that locality…. If these restrictions were withdrawn, friction would inevitably occur between the Chinese and your barbarian subjects, and the results would militate against the benevolent regard that I feel towards you. From every point of view, therefore, it is best that the regulations now in force should continue unchanged….

…

Regarding your nation's worship of the Lord of Heaven, it is the same religion as that of other European nations. Ever since the beginning of history, sage Emperors and wise rulers have bestowed on China a moral system and inculcated a code, which from time immemorial has been religiously observed by the myriads of my subjects. There has been no hankering after heterodox doctrines. Even the European (missionary) officials in my capital are forbidden to hold intercourse with Chinese subjects; they are restricted within the limits of their appointed residences, and may not go about propagating their religion. The distinction between Chinese and barbarian is most strict, and your Ambassador's request that barbarians shall be given full liberty to disseminate their religion is utterly unreasonable. …

It may be, O King, that the above proposals have been wantonly made by your Ambassador on his own responsibility, or peradventure you yourself are ignorant of our dynastic regulations and had no intention of transgressing them when you expressed these wild ideas and hopes…. If, after the receipt of this explicit decree, you lightly give ear to the representations of your subordinates and allow your barbarian merchants to proceed to Chêkiang and Tientsin, with the object of landing and trading there, the ordinances of my Celestial Empire are strict in the extreme, and the local officials, both civil and military, are bound reverently to obey the law of the land. Should your vessels touch the shore, your merchants will assuredly never be permitted to land or to reside there, but will be subject to instant expulsion. In that event your barbarian merchants will have had a long journey for nothing.

Britain thus could not penetrate and expand its trade with China, against which it was running a trade deficit. Tea imports alone reached 7000 tons per annum by the end of the eighteenth century. That was why the British exchequer did not care about free trade and imposed a duty of 100% on tea imports.

A solution to Britain's trade deficit problem with China was soon suggested; the East India Company would plant and sell increasing amounts of opium to China. In fact, seeing the increasing drug addiction, Chinese administrators had earlier outlawed the imports of opium. Sale of opium was forbidden by Emperor Yung-cheng in 1729 and Emperor Chia-ch'ing outlawed opium importation and cultivation in 1776. However, smuggling (by the Portuguese) and illicit sales continued to grow after the early eighteenth century. The East India Company took over the trade by the end of the century and dominated the market with its cheaply produced opium in Bengal under a newly developed method. According to some estimates, smuggling grew by 200 times between 1729 and 1838, only to double again between 1839 and 1884.[77]

Noticing increasing opium smuggling and illicit consumption, the Chinese administration reacted by strengthening border controls. Chinese Commissioners sent letters to Queen Victoria to stop her 'bad merchants' poisoning the Chinese. The letter went unnoticed; Britain wanted 'free trade' and argued that the Chinese administration had to stop closing the country to international trade.

A small incident of the Chinese customs officials' decision to destroy a party of opium became the much-sought *casus belli* for Britain to declare war against the Chinese Empire in 1839. The First Opium War lasted three years and ended with the clear victory of Britain, which devastated the Chinese army and cities.

Defeated, the Chinese had to sign the *Nanking Treaty*, which they later named the 'unequal treaty.' Under the treaty, Hong Kong was ceded to Britain and additional war reparations were paid by the Chinese. The Chinese also had to verify the 'free trade' rights of British opium exports. The First Opium War later was considered by the Chinese as the beginning of the 'century of humiliation.'

In 1856, the Second Opium War came after a new (and again minor) *casus belli*; the Chinese had pulled down the British flag and arrested the crew of an alleged pirate ship and did not release the crew upon the protest of the British Consul. The British side still referred to the free trade argument; the Chinese side, by trying to impede Britain's opium exports, was rebutting the sacred concept of free trade and preventing the British trade balance with China to be positive.

The second war proved a major physical and psychological destruction for the Chinese, as the French and American navy joined the British. Cities were bombarded and emblems of the Chinese Empire and its dignity burned down. The ultimate treaties with Britain, France, the USA, and Russia legalized the exports of opium to China, enlarged the powers and control of foreign merchants in China, and seceded Chinese land to them.

Britain's predatory policy did not go unnoticed even in Britain. William Gladstone, the future Prime Minister of the UK who was a young MP at the time, criticized the proposal of war for ethical reasons. Gladstone also had a personal reason other than humanistic principles to oppose the proposal; his sister had become an addict of an opium-based medicine. His well-known speech included:

> Does Macaulay [UK Secretary for War] know that the opium smuggled into China comes exclusively from British ports, that is, from Bengal and through Bombay? That we require no preventive services to put down this illegal traffic? We have only to stop the sailing of the smuggling vessels…it is a matter of certainty that if we stopped the exportation of opium from Bengal and broke up the depot at Lintin [near Guangzhou] and checked the cultivation of it in Malwa and put a moral stigma on it, we should greatly cripple if not extinguish trade in it. [The Chinese government] gave you notice to abandon your contraband trade. When they found you would not do so they had the right to drive you from their coasts on account of your obstinacy in persisting with this infamous and atrocious traffic.…justice, in my opinion, is with [the Chinese]; and whilst they, the Pagans, the semi-civilized barbarians have it on their side, we, the enlightened and civilized Christians, are pursuing objects at variance both with justice and with religion…a war more unjust in its origin, a war calculated in its progress to cover this country with a permanent disgrace, I do not know and have not read of. Now, under the auspices of the noble Lord Macaulay, that flag is become a pirate flag, to protect an infamous traffic.[78]

China could regain sovereign control of its land and people only by the mid-twentieth century. The Communist Party is still in power today. The country remained isolated from the external world until 1978 when the liberalization process introduced a dual economy, one communist and another capitalist. By that it soon regained the 'workshop of the world' title from Britain. By 2015, China became officially the second largest economy in the world in purchasing power parity (PPP) terms. In fact, had the PPP calculations been correct, it could have been considered the largest economy of the world in the same year as it was until the end of the eighteenth century.

Notes

1. Kennedy (1989: 193).
2. Szirmai (2015), Table 5.1.
3. Kennedy (1989: 193).
4. Jevons (1866).
5. For British trade during 1660–1700 see Davis (1954: 151–153).
6. Words in brackets are those of the author.
7. Stokey (2001).
8. It is known that the Flemings migrated to the British Isles from earlier times, including as mercenaries. From time to time, they were forced to leave England due to political reasons or when they had problems with the local population.
9. Llewellyn (1936).
10. Chang (2002).
11. Llewellyn (1936).
12. Llewellyn (1936).
13. Llewellyn (1936).
14. Llewellyn (1936).
15. See Crawford (1924), Smith and Cothren (1999), Chang (2007).
16. Lambert and Milan (2014: 733).
17. Rothbard (1995).
18. Rothbard (1995).
19. Chang (2007).
20. Thomas and McCloskey (1981: 94–95).
21. Fletcher and Kipling (1911: 105).
22. Bills, Public (3): Ancient statutes, charity, Ireland vol. 8. (Folios 1167 to 1750) p. 1309; Encyclopaedia Londinensis (1815: 635).
23. The Letter from John Adams to Secretary Jay (8 August 1785); Adams (1851: 296).
24. Cunningham (1892: 413–414).
25. For example, Cunningham (1892: 413) notes that John Taverner of Hull received a large encouragement when he built a large carrack.
26. Cunningham (1892: 413–414).
27. Bogart (1918: 91).

28. Text and spellings from Mun (1664).
29. Thomas and McCloskey (1981: 91–92), Morton (2003: 14).
30. After different rounds of legislation from 1660, by 1764, the list was expanded to include tobacco, sugar, indigo, cotton, ginger, fustic, and other dyewoods; later, naval stores, hemp, rice, molasses, beaver skins, furs, and copper were added; and still later, by the Sugar Act (1764), coffee pimento, coconuts, whale fins, raw silk, hides and skins, potash, and pearl ash (Thomas and McCloskey 1981) were added.
31. Bogart (1918: 62).
32. British imports from Europe included mostly linen yarn. Imports included flax, hemp, and some finished linens from Holland and Ireland and timber and naval material from the Baltics. Nevertheless, the British, by virtue of growing income and wealth, continued to import wine and gold mostly from Portugal and brandy from France (Thomas and McCloskey 1981: 91–92).
33. Cain (1999).
34. Thomas and McCloskey (1981: 88–89).
35. Davis (1954: 153–154).
36. Lapping (1989: 19).
37. Robins (2006).
38. Chaudhuri (1974: 127).
39. Yafa (2006).
40. Jack (2014), quoting from Seabrook (2015).
41. Robins (2006).
42. Balachandran (2003: 75); Meena (2015).
43. Meena (2015).
44. Meena (2015).
45. Bhatia (1968), Meena (2015).
46. Bhatia (1968), Maitra (2015), Meena (2015), Davis (2001).
47. Mukherjee (2010).
48. Rose (2009: 216), Panigrahi (2004: 94).
49. Minutes from Macaulay's speeches in the British Parliament on the Government of India Bill on 10 July 1833 (Macaulay 1967).
50. Minutes from Macaulay's speech in the British Parliament on 2 February 1835 (Macaulay 1967).
51. Minutes from Macaulay's speech in the British Parliament on 2 February 1835 (Macaulay 1967).
52. To review the fantastic story of cotton and how it drove slavery and capitalism see Beckert (2014).
53. Smith and Cothren (1999).
54. Riello (2013).
55. Solar (2012: 2), Riello (2013), Beckert (2014).

56. Riello (2013).
57. Solar (2012).
58. Beckert (2014).
59. Beckert (2014).
60. Beckert (2014: 87).
61. Beckert (2014: 100–101).
62. Beckert (2014).
63. Beckert (2014: 98–100).
64. Beckert (2014: 100).
65. North (1961: 233).
66. Dattel (2010: 61).
67. Riello (2010).
68. Beckert (2014: 93).
69. Inikori (1979: 58).
70. Ludlow (1918: 139).
71. Broadberry and Gupta (2010).
72. Laycock (2012).
73. Keller et al. (2011).
74. Keller et al. (2011).
75. Laycock (2012), Keller et al. (2011).
76. Backhouse and Bland (1914).
77. Opium Trade (2008) Encyclopaedia Britannica and Spence (1992: 235).
78. Hanes and Sanello (2004).

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CHAPTER 4

How Industrialized Nations Industrialized

It was not by accident that Great Britain experienced the Industrial Revolution. The country employed industrial policies prior to the Industrial Revolution. This chapter looks at the industrialization experience of selected other countries before the twentieth century. The key question is: Did they industrialize by accident? Or, did they employ industrial policies to develop manufacturing?

4.1 Hats, Tea, and Liberty: The American Quest for Manufacturing

Following the Industrial Revolution, Britain's desire to make the most out of its colonies evolved into a policy to keep the colonies as exporters of raw materials to the motherland. As the raw materials produced in the colonies could only be exported to the motherland—or through the motherland—, they would be cheaply priced. Britain would transform low-cost raw materials into high-priced manufactured goods, which then would be exported back to the colonies and elsewhere.

That effectively meant that the motherland would remain prosperous and powerful by keeping the manufacturing (and manufacturing 'value added') at home and preventing it in the colonies. These policies led to increasing dissent, rebellion, and ultimately freedom in the North American colonies, if not in others such as India.

M. A. Yülek, *How Nations Succeed*,
https://doi.org/10.1007/978-981-13-0568-9_4

What the Colonial Laws Meant for the Colony

In the seventeenth century, colonial administrators in British North America made efforts to develop manufacturing, albeit with little success.[1] 'Bounties' (cash payments by the government to firms based on their production levels) were introduced to promote the production of silk, paper, iron, and firearms, among others.[2] For example, in 1640, the Massachusetts government introduced a bounty of 25 cents on cloth production "for the incuragement of the manifocture"[3]; the colonial governments also levied tariffs to imports or exports of certain items mostly on an ad hoc basis and to raise revenue.

Positive results in the form of increased production of manufactured goods started to come in the eighteenth century. So did preventive attempts by the motherland in the form of colonial laws or taxes. By the 1730s New England possessed at least 'six furnaces and nineteen forges' and by 1750, four slitting and rolling mills, ten forges, and five steel furnaces. As Bogart (1918: 61) writes with reference to the Iron Act (1750), "the development of the [iron] industry led Parliament to prohibit any slitting or rolling mill plating forge or steel furnace under a penalty of £200, in order to protect home manufacturers." When, 10,000 hats were reportedly manufactured in 1731 in New England and New York, "in response to a petition by London hatters, the exportation of hats from the colonies was prohibited and their further manufacture limited."[4] Tench Coxe, a political economist and a former Assistant Secretary of the Treasury (when Alexander Hamilton was the Secretary of Treasury), estimated, in 1789, the total value of manufactured goods at about $50 million "as certainly greater than double the value of their exports in native commodities."[5]

Americans did not quite agree with the taxes to finance the British Crown and the British policy of limiting the colony's economy to production raw materials. The prohibitive laws by the British Parliament often lacked strong enforcement; smuggling, illicit production, and trading by colonial merchants abounded, counteracting the British prohibitions favouring the motherland. The colonial merchants knew how to deal with the motherland.

Nevertheless, the dissent among the people and governments of the American colonies against British protective policies grew over time. The colonies were convinced that the motherland selfishly followed its own interests, which were in conflict with those of the colonies. The antagonism towards British colonial policies had already given way to some resistance to luxury imports from Britain and an increasing desire to lessen colonies' dependence on Britain.[6]

Bad Finance at Home, Bad Taxes in the Colonies

After being victorious in the Seven Years' War against the French and Spanish in 1763, England's dominions in North America (mainly New France and Florida) and the West Indies expanded in addition to the French posts taken over in India. Having become the global hegemonic power, England's political confidence rose, while it suffered from rising public debt. The decision to keep a standing army in the colonies further constrained the British budget. All this led to an increasing tendency in England to increase and enforce colonial taxation after 1763.

Implementation of the policy by England was rapid and triggered severe protests in the colonies. In 1764, the Sugar Act set or increased heavy duties on colonial imports, including sugar, wine, indigo, coffee, East Indian silk, and calicoes. In 1765, new duties on more commodities, including tea and lead, and new taxes were introduced by the Stamp Act. After increasing pressure from the colonies, it was repealed by the British Parliament only to pass similar Acts in 1767 (*The Townshend Acts*) in a new experiment which would also be repealed due to similar discontent in the colonies. These Acts were instrumental in raising the antagonism against English policies in the colonies. Colonial merchants protested by refusing to import and sell English exports and American people increasingly tended to use domestically manufactured rather than English goods.

These reactions proved painful but also successful; British exports to America rapidly fell and pressure on England rose, ultimately leading to repeal of the provisions of the acts except for the duties on tea imports to colonies. However, the protests ultimately led to the independence of America from Britain. The Crown sent warships and an army to Boston and Boston was occupied by Britain after clashes with Bostonians and incidents such as the 'Boston Massacre.' Adam Smith is known to have written that "the expectation of a rupture with the colonies struck the people of Great Britain with more terror than they ever felt for a Spanish Armada or French invasion, and rendered the repeal of the Stamp Act, among the merchants, at least, a popular measure."[7]

The East India Company, in financial distress, had received the monopoly rights to sell its tea directly to the colonies through the *Tea Act* of

10 May 1773. Previously, tea was exported to the colonies by English merchants, who bought it in London auctions, to which it was imported by the Company upon payment of duties to the Treasury.

The ultimate price of tea that the Company sold in the colonies was higher than the competing tea smuggled from the Dutch ships (at the order of almost a million pounds in weight a year). The Tea Act was supposed to grant the Company the monopoly power to arrange the selling prices and to make good money for its trade. The British Treasury would also gain revenues at the expense of colonial tea lovers through the notorious Townshend duty, the only duty that was not repealed.

The new British decision revived American protests. On 16 December 1773, the "Sons of Liberty" led by John Hancock, a businessman, whom the British considered a smuggler of Dutch tea to the colonies, destroyed the tea aboard the East India Company ship. This incidence became popularly known as the 'Boston Tea Party' and triggered the independence of America in 1776 after a heroic fight by its people. About 300 years later, Tea Party would be the name of a new political movement in the USA. The American independence came as a result of not only resistance to taxes imposed by London but also the wish to industrialize.

Founding Fathers of American Manufacturing and the USA

In the wake of the technological innovations in the second half of the eighteenth century, Britain prohibited and penalized the export of its (high-tech at the time) textile machines, plans, or models to colonies and elsewhere. The migration of skilled textile workers and masters to colonies or rival countries was also prohibited. Britain wanted to protect its position as the cotton textile manufacturer and exporter of the world.

A young Samuel Slater migrated, or rather fled, from Manchester in 1789. As transferring technological secrets out of the UK was forbidden and severely punished, he was careful not to take any drawings and written notes with him. Instead he had memorized the details, which helped him rebuild a model of Arkwright's mill in the USA.[8]

Protective policies in the USA started immediately after the revolution. Through a mixture of objectives of raising revenue and supporting manufacturing, the very second Act passed by the Congress after the new constitution in 1789 ("the Tariff Act") introduced protectionary measures in order to develop domestic manufacturing industry and reduce economic dependence on Britain:

> [W]hereas it is necessary for the support of the government, for the discharge of the debts of the United States, and for the encouragement and protection of manufactures, that duties be laid on goods wares and merchandise imported.

Perhaps more importantly, an important person, Alexander Hamilton, one of the Founding Fathers of the USA, objected to British prohibitive policies and advocated manufactured goods. Hamilton—then the Treasury Secretary in the George Washington administration—submitted *The Report on Manufactures* to the Congress in 1791. The Report argued that American economy should be based on manufacturing not agriculture if it was to prosper; so, measures had to be taken in order to develop manufacturing in the USA. In order to develop manufacturing, the government could intervene with protective duties on imports of manufactured goods or other means.

Hamilton thus effectively rejected some popular schools of economic thought of the time. The Physiocracy, a prevailing school of economic thought in France at the time, emphasized agriculture as the leading developer of economic value and power. Adam Smith's newly published book in Scotland, *The Wealth of Nations*, on the other hand, argued against different forms of government intervention.

Hamilton's ideas, although not with adequate reference, later became better known in Europe due to a German economist, Friedrich List, who travelled to the USA when the Report was submitted to the Congress. Friedrich List's well-known book *The National System of Political Economy* clearly underlined the developmental role of government in drawing industrial policy in addition to freedoms, rule of law, and institutions:

> It is … only a conditional commonplace truth on the faith of which J. B. Say would exclude politics from his doctrine. In every case it is the chief desideratum that the administration should be good; but the efficiency of the administration depends on the form of government, and that form of government is clearly the best which most promotes the moral and material welfare and the future progress of any given nation. Nations have made some progress under all forms of government. But a high degree of economical development has only been attained in those nations whose form of government has been such as to secure to them a high degree of freedom and power, of steadiness of laws and of policy, and efficient institutions.

> Hence, the nature of things led the great monarchies to adopt such political measures as tended to restrict the importation of foreign manufactured goods, and foreign commerce and navigation, and to favour the progress of their own manufactures, and their own commerce and navigation. Instead of raising revenue as they had previously done by duties on the raw materials which they exported, they were henceforth principally levied on the imported manufactured goods. The benefits offered by the latter policy stimulated the merchants, seamen, and manufacturers of more highly civilised cities and countries to immigrate with their capital into the great monarchies, and stimulated the spirit of enterprise of the subjects of the latter.[9]

Although state administrations in the USA were keen to develop manufacturing, the Congress did not accept Hamilton's ideas with adequate strength at the time. Hamilton, a man of action, nevertheless went on with his crusade to industrialize the USA; with Tench Coxe, he conceived and started probably the first industrial zone in world history. In 1791 he established a private company under the name, *The Society for the Establishment of Useful Manufactures*, with the objective of establishing factories (in Hamilton's words a 'national manufactory') in a town to be called Paterson, which was the name of the New Jersey Governor who chartered the company. The company was in the form of a semi-governmental enterprise with certain tax advantages.

Endowed with the powerful Passaic rivers and waterfalls, Paterson was selected in order to benefit from the water power. The chartered company would build factories. However, the enterprise was not successful due to many failures, including the inadequate capital. The first textile mill could not operate; it soon fell victim to a fire and closed down. However, with its attractive features, Paterson soon became a centre of textile industry by investors, who bought land from the Society. By time, in the nineteenth century, steel and locomotive industries settled in Paterson, while textile industries migrated to New England when steam power replaced rivers.

4.2 Japan's Industrial Policy and Late Industrialization in the Nineteenth Century

Japan is another late developer and industrializer. First the USA and then European forces forced Japan to open to international trade around the same time as China. Japan's fascinating industrialization process starting in the second half of the nineteenth century was a reaction to the 'unequal treaties' that it was forced to sign with Western forces. Economic and industrial development accompanied the simultaneous military reform. In turn, these two factors fed the subsequent belligerence and territorial expansion efforts of Japan in East Asia starting at the end of the century.

There are a number of reasons that played important roles in Japan's rapid economic development starting with the second half of the nineteenth century: broken national pride and a desire to expel the 'barbarians,' a good analysis of the changing world and the industrialization process following the Industrial Revolution, focused industrial policy (coupled with simultaneous export orientation in addition to import substitution), and the industriousness and entrepreneurship of the Japanese people and business circles.

Frightening Black Ships in Edo

On 8 July 1853 (i.e. 14 years after the First Opium War started and three years before the Second) American warships entered the Edo (today's Tokyo) Bay. The large steamships that they later called 'black ships' for the first time were a frightening sight for most of the Edo population of about 1 million. Commodore Matthew Perry, who led America's first mission of 'gunboat diplomacy,'[10] was successful in further multiplying the psychological image of his small fleet. The worried Japanese officials were handed a letter from US President Fillmore to the Japanese Emperor demanding Japan to sign diplomatic and commercial treaties with the USA.[11]

The political power in Japan was wielded by the Samurais—military feudal lords headed by the Shogun and its government, the 'Bakufu,' since the fourteenth century. Edo, where the Shogun and the Bakufu resided, was one of the largest cities in the world at the time, but it was closed to the outside world. The Japanese Emperor, who did not have political power, resided in Kyoto, not Edo.

Tokugawa Shogunate was established by Tokugawa Ieyasu (徳川 家康) at the end of the sixteenth century. Japan, under the 'sakoku' policy, was closed to the outer world after 1634 except for Dejima, where a small colony of Dutch traders were allowed to stay. The Tokugawa government was disturbed by the trading and missionary activity around Nagasaki:

> The purpose of the policy was to put an end to what the Shogunate perceived as missionary interference and the potential corrupting influence of contact with foreigners, especially Western 'barbarians.' The full title of the Shogun

means "barbarian-subduing general," and the power to stop Westerners from violating Japan's seclusion policy was seen as a measure of the Shogunate's right to hold power. (Pinkert and Potter 2004)

The Unfair Treaties

While there were several motives for Perry's mission, the key objective was to open Japan to American trade and to get other diplomatic, military, and commercial concessions. That had to be done before others (British and French) came; the USA was in a hurry to get a foothold in Asia, as Britain was gaining control of China's trade after the First Opium War. The Second Opium War, which started in 1856, would enable the USA, along with Great Britain, Russia, and others, to open their quarters in Tianjin and start commercial activities in China.

Perry conveyed to the Emperor President Fillmore's letter dated 12 November 1852, which was a very well written one diplomatically, asking several conditions from the Emperor. The first and most important one was free trade between the two nations:

> I have directed Commodore Perry to assure your imperial majesty that I entertain the kindest feelings towards your majesty's person and government, and that I have no other object in sending him to Japan but to propose to your imperial majesty that the United States and Japan should live in friendship and have commercial intercourse with each other.
>
> The Constitution and laws of the United States forbid all interference with the religious or political concerns of other nations. I have particularly charged Commodore Perry to abstain from every act which could possibly disturb the tranquility of your imperial majesty's dominions.
>
> The United States of America reach from ocean to ocean, and our Territory of Oregon and State of California lie directly opposite to the dominions of your imperial majesty. Our steamships can go from California to Japan in eighteen days.
>
> Our great State of California produces about sixty million of dollars in gold every year, besides silver, quicksilver, precious stones, and many other valuable articles. Japan is also a rich and fertile country, and produces many valuable articles. Your imperial majesty's subjects are skilled in many of the arts. I am desirous that our two countries should trade with each other, for the benefit both of Japan and the United States.
>
> We know that the ancient laws of your imperial majesty's government do not allow of foreign trade, except with the Chinese and the Dutch; but as the state of the world changes and new governments are formed, it seems to

> be wise, from time to time, to make new laws. It was a time when the ancient laws of your imperial majesty's government were first made.
>
> About the same time America, which is sometimes called the New World, was first discovered and settled by the Europeans. For a long time, there were but a few people, and they were poor. They have now become quite numerous; their commerce is very extensive; and they think that if your imperial majesty were so far to change the ancient laws as to allow a free trade between the two countries it would be extremely beneficial to both.

An accompanying letter by Commodore Perry dated 7 July 1853 was also handed to the Emperor, strengthening the diplomatic requests of the President through a politely worded threat that more American ships would come to Japan next year if the Emperor did not sign the treaty:

> The undersigned holds out all these arguments in the hope that the Japanese government will see the necessity of averting unfriendly collision between the two nations, by responding favourably to the propositions of amity, which are now made in all sincerity.
>
> Many of the large ships-of-war destined to visit Japan have not yet arrived in these seas, though they are hourly expected; and the undersigned, as an evidence of his friendly intentions, has brought but four of the smaller [ships], designing, should it become necessary, to return to Edo in the ensuing spring with a much larger force.
>
> But it is expected that the government of your imperial majesty will render such return unnecessary, by acceding at once to the very reasonable and pacific overtures contained in the President's letter, and which will be further explained by the undersigned on the first fitting Occasion.
>
> The undersigned holds out all these arguments in the hope that the Japanese government will see the necessity of averting unfriendly collision between the two nations, by responding favourably to the propositions of amity, which are now made in all sincerity.

The 'gunboat diplomacy' worked. The Kanagawa Treaty (日米和親条約) was quickly signed on 31 March 1854 during Perry's second visit, six months after the first. The treaty opened Shimoda and Hakodate ports to American merchants. It also granted coaling rights to American ships in Japan.

More importantly, a full free trade agreement (the Treaty of Amity and Commerce, 日米修好通商条約) was signed on 29 July 1858. The progress of the Second Opium War, which began in 1856, had convinced the Japanese that signing the treaty would be wiser than resisting it.

The text of the agreement was not very much different from the other free trade agreements of the time forced by great powers on less developed economies. The Ottomans and the Chinese, among others, were given, more or less, the same text to sign.

Under the new treaty four more ports were opened to American merchants. More importantly, the agreement granted free trade and residence rights to American merchants along with the right of extraterritoriality. The latter meant that if American merchants committed a crime in Japan, they would be tried only by the American consulate under American laws. Soon the Japanese were forced to sign similar texts with the British, French, Dutch, and Russians.

As the treaties were not signed willingly by the Japanese and the two sides of the treaties were not equal partners, the Japanese named the trade agreements as 'unfair treaties.' That was similar to the names the Chinese and the Korean gave to their own treaties with the Western powers.

The Coal …

There were other motives for the 1843 American expedition to Japan, including the missionary effort[12]; the belief that Japan had large coal deposits was a relatively important one. The American administration considered Japan not only as a gateway to China that was being forced open to trade, but also as a coaling station for new American steam ships (mostly commercial) to navigate to the Middle Kingdom.

In the nineteenth century the quest for energy was looming with the preceding Industrial Revolution. The oil industry was in its genesis; the first-to-be refinery of the world in Baku, Azerbaijan did not exist and coal was still a very important energy source. That was why the US Secretary of State Daniel Webster saw coal as a 'great necessity of commerce' and believed that no nation had the right to withhold resources from those who needed it. Webster wrote that "the interests of commerce and even those of humanity [required Japanese coal], a gift of … [God] … in the depths of Japanese Islands for the benefit of the human family."[13]

Japanese Industrialization in the Meiji Period

Prior to the Meiji restoration, Japan was an agrarian society. Agriculture, forestry, and fishing accounted for a major part of the working population and national output. Extraction of silver helped the government as a source of revenue and its exports financed imports of foodstuff.

Under the 1858 agreement, free trade rights of the USA and Japan were reciprocal; however, the Japanese, not aware of the developments in the external markets for centuries, clearly lacked any physical infrastructure and skilled merchants to export products to the USA apart from selling products to the American merchants. Moreover, their products were traditional; not fancy or low-cost manufactured products. Thus, not surprisingly, following the opening up of Japan, Japanese imports (which consisted mainly of manufactured goods) rose. About half of all imports came from Great Britain.[14] On the other hand, its exports consisted primarily of agricultural and mining products.

Against this background, the Japanese reaction to the unfair treaties and forced opening up to international trade in the second half of the nineteenth century was a successful industrialization process and export orientation through focused policies. Instead of becoming a passive open market for fancy imports, Japan managed to integrate itself into the global trade as an increasingly industrialized nation. This began under the reign of Emperor Meiji during 1868–1912. The period was later named the "Meiji Restoration," which involved wide-ranging reforms in the state and military administrations, economic structure, and education.

The fall of Edo and the collapse of the Shogun regime led to the empowerment of the Emperor, who enabled a group of elite bureaucrats to design and undertake reforms. A number of popular slogans were minted to summarize the targets. They are illustrative of what the reformers aspired to achieve: economic catch-up and military and political strength; for example, *fukoku kyohei* ('rich nation, strong army'), *Shokusan Kōgyō* ('support industry'), and *sonno joi* ('honour the emperor and expel the barbarians').[15]

By 1912, the end of the Meiji Restoration, Japan had already become a relatively industrialized nation. Production of manufactured goods grew and penetration into the external markets began (mainly neighbouring countries and the USA). Stronger growth and penetration were achieved in the subsequent decades on the foundations laid during the Meiji period.

Industrialization and exports went hand in hand; Japan followed not only the import substitution road but also the promotion of exports. In addition, by going the export orientation (or export-led growth) avenue, it "learned-by-exporting." The slogan for this was (*yushutu shinko, yunyu boatsu*) ("promoting exports and restricting imports").[16] After the Second World War, the establishment of the Ministry of International Trade and Industry, which designed the country's international trade and industrial policies under one roof, was another reflection of the same principle that the Japanese policymakers learned early on: for industrialization, use not only the domestic markets but the whole world market. Osaka would be the 'Manchester of the East.'

So successful was Japanese export-oriented industrialization that it quickly captured the attention of Britain and other industrialized countries of the West by the turn of the century. Following the Second World War, Generalized Agreement on Tariffs and Trade (GATT) was established to promote free trade among world countries. GATT aspired to increase its membership, whereby trade barriers would be abolished. Japan's application to become a member of GATT in 1952 was objected to by a number of countries, including the UK and Holland. The UK, which was the leading promoter of free trade and free trade agreements in the nineteenth century, was reluctant to let Japan join the free trade club of the twentieth century because, as it complained, Japan was dumping its manufactured products in the British domestic market[17]; a report commissioned by the British government indicated that British industries would be severely damaged by Japan's entry into GATT, eliminating British government's protection tools.[18]

Indeed, the share of Japanese exports in total world exports, especially in textiles, grew rapidly so that Japan became the largest textile exporter in the world by the 1930s (Table 4.1). That was quite an achievement for the losing side of the unfair treaties only half a century before.

Industrial Policies in the Meiji Period

The Meiji restoration and its policies laid the groundwork for the process of industrialization in Japan. Upon this groundwork, industrialization

Table 4.1 Shares of countries in world textiles exports

	UK	*France*	*USA*	*India*	*Japan*
1882–1884	82.0	14.3	2.8	0.9	–
1910–1913	70.0	20.0	4.2	1.0	2.1
1926–1928	46.1	27.1	6.3	2.0	16.3
1936–1938	26.9	21.5	3.9	3.1	38.9
1949	19.7	31.4	19.3	10.1	16.2
1955	11.8	28.8	11.5	16.3	24.2

Source: Rose (1990: 3) and Robson (1957) accelerated and its fruits became much more visible during the subsequent decades under Emperors Taisho (1912–1926) and Showa (1926–1936).

The 'traditional' Japanese industrial policies, which consisted mainly of targeting selected manufacturing sectors to develop the country's capacity, were subsequently named 'picking the winners.' The Japanese subsequently repeated similar policies in essence during the 'high-growth period' (1953–1973) in the aftermath of the Second World War. These industrial policies have been hotly debated and were taken as examples by other countries, mainly in East Asia, in the twentieth century. Likewise, the 'export-orientation' principle of the traditional Japanese industry became a norm for policy prescriptions after 1980s.

Specifically, the government established state-owned enterprises (SOEs) in the manufacturing sector which imported state-of-the-art machinery and equipment. It supported education of engineers and technical staff abroad.[19] Local technical education was strengthened through institutions such as the newly established Institute of Technology and technical high schools. The first SOEs, while not quite successful in their own right, acted as on-the-job training facilities for white- and blue-collar textile manpower for the private sector. The technical staff transferred from SOEs to private firms generated 'spillovers' in the form of absorption and diffusion of technology.

During the Meiji period the primary target of the government was light industries, although heavy industries were also not neglected entirely. Among the light industries, cotton textiles were probably the most important and one that helped the early industrialization in Japan.

Following the signing of the free trade agreements, external demand (mainly from the USA) for Japanese silk and tea boomed. This led to increasing production and income in the rural areas as well as providing foreign currency earnings. However, imports of cotton and cotton textiles rose steeply.

Viewing the growing cotton and cotton yarn imports as well as woollen products (which formed more than half of all imports and came primarily from Great Britain), the Japanese government first targeted an import-substituting industry, which later became an exporter. Model factories in cotton spinning were established in the 1870s by the government, As Ohno (2006: 75–76) underlines, these SOEs did not succeed commercially due to such reasons as low capital, low capacity, or low access to energy (water power) and lack of expertise.

The turning point came when the private Osaka Spinning Company (Osaka Boseki Kaisha) was established in 1883 by the strong initiative of Eiichi Shibusawa, a wealthy businessman. Worried about rising cotton yarn imports, Shibusawa decided to create a new company that could overcome the defects of SOEs. He established the company in the form of a joint stock company with equity investment from other businessmen. The company also received loans from the First National Bank, at which Shibusawa was the president. Osaka Spinning Company introduced some innovations. Shibusawa identified Japanese students studying in Great Britain, directed them to study engineering, and subsequently hired them at the stage of the establishment of the Osaka factory. Other foreign-educated engineers played an important role in the rise of the Japanese cotton spinning companies.[20]

As a consequence, at the end of the nineteenth century, Japanese textile imports more or less disappeared. Instead, Japan became an importer of raw cotton from India and an exporter of cotton yarn and textiles mostly to the neighbouring Asian countries.[21]

In the heavy industries (shipbuilding, iron and steel, railway equipment, chemical) and weapon industries, the government contributed to the industrialization in two ways: first getting directly involved in manufacturing through the SOEs, and secondly through encouraging private sector involvement. Initially, SOEs took the lead using imported machinery. By the turn of the century, private firms slowly started to be active in heavy industries. They transferred engineers and workers from the state enterprises acting as a practical vocational school for this critical manpower. Some of the employees of the SOEs started their own businesses.

The example of the development of the railway equipment sector is also illustrative. During the Meiji period, two SOEs, Shimbashi and Kobe, were formed to manufacture railway carriages and made two thirds of the total production. Subsequently, Shimbashi Factory developed and provided blueprints for locomotives to two private companies (Japan Railroad Company and Kansai Railroad Company) which produced and conducted the test drives of the first Japanese locomotive in 1900. "In 1912, the Railroad Agency nominated four private companies to copy-produce locomotives. But since these companies were still technically incompetent, the government provided them with technology, material inputs, production management, training (which included opportunities to study abroad), and the promise of official procurement. Hence the market was secured.

In this way, the government pampered the burgeoning railroad industry which, thanks to such assistance, eventually came to possess world-leading technology during the inter-war period."[22]

During the Meiji period, machinery industry in Japan was not even in its infancy. The relatively small domestic machinery manufacturing was undertaken by the SOEs such as Tokyo Artillery Factory, the Yokosuka Naval Arsenal, and the Osaka Artillery Factory. SOEs had some financial means to import machinery, while the private sector had none. They also enjoyed larger-scale production facilities. The products were imitations of western products and were not competitive internationally. During the Meiji period, "Made in Japan" meant low price and low quality.[23]

Nevertheless, the machinery industry, along with railway equipment and shipyards, was growing. Production and technology absorption by private firms happened gradually. In addition to existing larger groups, new businesses were formed in Tokyo and Osaka. Engineers and technical staff trained by the government or previously employed by the SOEs shifted to the private companies, aiding the process. All this gave way to as enormous development in machinery industries in the subsequent decades.[24]

Japan as an Industrialized Nation

Japan had reached a respectable level of industrialization by the end of the nineteenth century thanks to the industrial policies during the Meiji period. This first phase of rapid industrialization continued until 1930s under different emperors. Military reform accompanied industrial policies; at the end of the nineteenth century Japan had a strong army and navy, which fought overseas wars (with China and Russia to start with). Victories of the Japanese military over China and Russia enabled Japanese expansion in Asia. The victim of economic and military aggression was now changing roles.

Following the Second World War, during the 1950s until the 1970s Japan recorded very high growth rates on the back of rapid industrialization. This so-called high-growth period was in fact its second rapid industrialization experience. During this period, Japan's output, income, and trade surplus with the USA and the European economies increased rapidly. With the growing trade surplus, the country's international reserves reached record levels. Following the oil shock in 1973, Japan was pressured by the developed economies to liberalize its economy, to increase the real value of its currency (Plaza Accord), and to reduce its trade surplus with Europe and the USA by voluntarily limiting its exports. In the later part of 1970s and 1980s, Japanese investments abroad, especially in the USA, surged, financed by its large international reserves. This was the period when Japanese investors bought landmark assets such as Rockefeller building in the USA.

4.3 French Way of Picking the Winners: Colbert's Industrial Policies in the Seventeenth Century

Mercantilism is generally known as protective and export-oriented policies to stimulate specie inflow. In fact, mercantilism was an industrial or industrialization policy, at least in the French and British context. Mercantilist industrialization policies, as in the case of commerce, entailed also creation of 'national champions' and granting them monopoly rights. In the French context, early national champions included those in the manufacturing industry.

The French efforts to 'industrialize' date back at least to the second half of the seventeenth century. Louis XIV, the flamboyant Sun King, was quite ambitious; his 72-year-long rule passed with continuous wars to extend the borders of France. He subdued rivals in Europe and gained colonial territories in Asia and America. Other than strengthening the central control in France by eradicating the last Protestant population and the remnants of the feudal lords, he commissioned the construction of the extravagant Versailles Palace and organized parties—in fact, many of them—where participants had to wear luxury costumes to reflect the grandeur of France-in-the-making. More importantly, he was keen to strengthen the French economy and treasury, which was at the brink of collapse when he took over.

Louis XIV also followed policies to develop French industrial 'capacity,' for example, in the fashion industry.[25] At the time what could be called fashion in Europe was dominated by the Spanish. While France at the time was an importer of almost all luxuries (silk fabrics, glass, furniture, textiles, etc.) Louis XIV saw in them a great economic opportunity for France. In today's terms, policies in his time can be characterized as simultaneous import substitution and export promotion of manufactured goods. Furniture, textile, clothing, and jewellery industries established during his reign created much employment in France and made the country a leader in design and manufacturing.[26]

Jean Baptist Colbert was the main champion of the mercantilist industrialization policies. A protégé of the Sun King and an able statesman, he was appointed as the Minister of Finance. He was also the champion of the French colonization effort. His ambitions for a powerful France were in line with those of his master; he famously said, "[F]ashion is to France what the mines of Peru were to Spain." In other words, he saw industry as a source of wealth.

That was in contradiction with the French economists of a century later. To Quesnay and the 'Physiocrats' the source of wealth was agriculture at a time when the British were experiencing the Industrial Revolution.

Colbert had the will and analytics to convert ambition into industrial policies. He seems to have visioned the France-to-be as an industrialized exporter (and not an importer) over a vast territorial market made possible by colonization. That was before England (and any other country in the world) witnessed the Industrial Revolution and possessed a large colonial Empire.

Colbert micromanaged a sectoral policy where he identified strategic manufacturing sectors and implemented policies to increase the domestic manufacturing capabilities in them. He also established strict regulations (especially in terms of product quality) governing manufacturing and obligated all manufacturing to be organized in guilds.[27] The tariff reform of 1664 raised the duties on imports so that the industries to be formed could be protected until they could compete with external rivals. The Royal Council of Commerce was charged with the task to identify problems of merchants and manufacturers and propose to Colbert measures to solve them.

Friedrich List (1841) commended Colbert:

> Colbert had the courage to grapple single-handedly with an undertaking which England could only bring to a successful issue by the persevering efforts of three centuries, and at the cost of two revolutions. From all countries he obtained the most skilful workmen, bought up trade secrets, and procured better machinery and tools. By a general and efficient tariff, he secured the home markets for native industry. By abolishing, or by limiting as much as possible, the provincial customs collections, by the construction of highways and canals, he promoted internal traffic. These measures benefited agriculture even more than manufacturing industry because the number of consumers was thereby doubled and trebled, and the producers were brought into easy and cheap communication with the consumers. He further promoted the interests of agriculture by lowering the amounts of direct

> imposts levied upon landed property, by mitigating the severity of the stringent measures previously adopted in collecting the revenue, by equalising the incidence of taxation, and lastly by introducing measures for the reduction of the rate of interest.
>
> To the extension of the foreign trade and the promotion of fisheries he devoted special attention. He re-established the trade with the Levant, enlarged that with the colonies, and opened up a trade with the North. Into all branches of the administration he introduced the most stringent economy and perfect order. At his death France possessed 50,000 looms engaged in the manufacture of woollens; she produced annually silk manufactures to the value of 50 millions of francs. The State revenues had increased by 28 millions of francs. The kingdom was in possession of flourishing fisheries, of an extensive mercantile marine, and a powerful Navy.[28]

Making France a Textile and Glass Country

Glass and textiles are good and important examples for sectors targeted by Colbert. Colbert realized that in both items, France ran a large trade deficit; with Venice in glass and with Holland in textiles. So, he went on to develop local industries with a mixture of protective and monopolistic policies and turned them into exporters of manufactured goods.

On the one hand, Colbert levied duties on imports. On the other, he approached business groups, offering them monopoly rights to sell the products in France if they manufactured them in France. Financial assistance by the government was also arranged for the capital expenditures. Finally, he arranged 'technology transfer' by 'debauching' or enticing glass masters from Venice and weavers from Holland.

Glass began to be used in windows around the thirteenth century in Italy. It was a technological good; it took more than 400 years for flat glass to be manufactured in England (first by a Venetian glass maker there) and to be widely used. Until the seventeenth century, Venetians were the only major producers of flat glass and mirrors in Europe. Jealously keen to preserve their know-how, strict controls were instituted to prevent the technology from sneaking out of Venice. However, the controls were only partly successful.

Colbert paid (from the French budget) for two glass masters to migrate secretly from Venice to Paris. He helped *Nicolas du Noyer* to establish *Manufacture Royale des glaces de miroirs,* a firm to manufacture glass. It was like an early version of a public-private-participation (PPP) project in the manufacturing sector. The government acted as a technology foresighter, capital partner, and supporter of technology transfer. The firm was granted the monopoly rights for glass manufacturing and selling for 20 years, which was renewed for a second term—another government support. It took two years for French glass to be manufactured at a level of quality that could compete with the Venetian glass. Colbert was successful in converting the French glass market from an importer to an exporter of manufactured goods. The company continued to grow on a bumpy but steady route. Today, *St Gobain*, direct offspring of *Manufacture Royale*, is one of the largest companies, boasting also that it is one of the oldest in the world which is still operative.

In textiles Colbert's prime objective was to cut off imports of *laken*, the Dutch fine cloth made in Leiden. He also wanted to make France an exporter of fine textiles (mostly woollen but also cotton to some degree) in the Mediterranean (especially to the Ottoman Empire). That trade was dominated at the time by the British and the Dutch. For that, however, France first had to acquire the skills and machinery that the Dutch exclusively possessed. The Genoese and the Venetians were also after the same, but Colbert shrewdly used the window of opportunity opened by the Anglo-Dutch war in 1665–1667 in which the two significantly damaged each other's Mediterranean trade. When that war created a recession in Leiden, Colbert was quick to send his 'diplomats' to Leiden to invite Dutch masters and workers to France with their machinery.[29] One of Colbert's letters to the French ambassador in Holland said: "[W]ith regard to your advice as to the almost entire ruin of the manufacturers of Leiden, if you could manage to let some of the chiefs of these manufactures know, in confidence, that if they would settle in France we would take care that they reaped all sorts of advantages, your action would be greatly to the profit of the Kingdom."[30]

The migrated Dutch cloth masters and workers were provided royal loans, free premises, and export subsidies. Colbert's project was immensely successful in creating the textile industry in France; by the end of the century (shortly after the death of Colbert) France became the dominant power in the Mediterranean textile manufacturing and trade.[31]

Colbert targeted other manufacturing sectors such as shipbuilding and weapons. Moreover, he developed France's transportation infrastructure (roads, canals) and initiated the founding of the Academy of Sciences and the Paris Observatory.

Educational Reforms

The French government's educational reforms helped industrialization but were generally considered inadequate. Graves (1964: 158) remarks that "[t]he educational response to the expansion of the French economy in the nineteenth century was very limited. There was (i) a very limited total provision of technical education at the middle and lower levels, (ii) a lack of adaptation of the public provision of technical education to the needs of the key industries."

The introduction of basic, technical, and vocational education in the eighteenth century without doubt helped the indoctrination process. Free (but not compulsory) primary education came in 1833 for towns with a population larger than 6000 through the Guizot Law. However, the primary education did not have any technical aspects until 1870 and only in Paris (Graves 1964).

Apprenticeship schools were established in France after 1826 (Graves 1964), including an earlier boarding school in Saint Yon by the Christian Brothers (de La Salle 1996). Technical schools, on the other hand, were first established during the eighteenth century. They included School of Bridges and Roads, School of Mines, Royal Academy of Architecture, and Royal Military School. A technical school, *Ecole d'arts et métiers*, directly related to the manufacturing industry, was established in 1803 in Compiégne directly by Napoleon Bonaparte. It covered areas such as technical drawing, mathematics, and textile-related curriculum. Though another one was established in 1812 in Beaupréau, both schools became effective centres of learning only after 1832 and a third technical school was established in 1843 (Graves 1964). In 1829, the School of Arts and Manufactures was established. One of its graduates, Gustave Eiffel, designed the Eiffel Tower, constructed in 1989.

France as an Industrialized Nation

In the eighteenth and nineteenth centuries, France's industrialization and economic development was not a tidy process. It experienced the French Revolution in 1789 and subsequent political turmoil during the Napoleonic years until early nineteenth century. Nineteenth century was a difficult one for France; its economic growth was slow on the average, although it had faster growth rates in some sub-periods.

Nevertheless, France became one of the first countries after Britain to experience the Industrial Revolution. In this, it was one of the two larger Western European economies along with Germany. It continued to be among the largest and most powerful economies in the world. This was made possible by the efforts of pioneers such as Colbert in the seventeenth century.

State support to industry in France continued in the nineteenth[32] and the twentieth century. Manufacturing industries in France such as textiles, iron and steel, electrical goods, cement, motor cars, and chemicals grew rapidly generally after 1825 in parallel with economic growth. While Belgium quickly 'received' (and did some reverse engineering) modern British textile machinery and technology, modern textile machinery did not arrive in France until after 1830. Significant growth of the iron and steel industry came after 1812 and increased nearly six-fold until 1847 to 591,000 tons supported by the development of railway construction (1839–1859). However, production remained on small scale. The industry started to experience a process of consolidation to fewer and larger units in the second half of the nineteenth century only to accelerate at the end of the century.[33]

Alsace region became home to France's heavy industries. The de Wendel family started its iron forging business in 1704. The first locomotive was manufactured in France in 1838 by the Le Creusot company. The company then moved into the manufacturing of artillery and competed with Germany's Krupp. Growth of the banking sector began in 1848 and the great banks were mainly founded between 1852 and 1863.

4.4 Germany: Another Late Industrializer

At the end of the eighteenth century, Germany was highly fragmented. Following the Treaty of Westphalia in 1648, what is called Germany today was made up of more than 400 political and economic entities (cities, princehoods, lordships, etc.). Until the German customs union (*zollverein*) in 1834, movement of goods among these entities was hindered by various taxes, measurement standards, and customs administrations set out by each entity on the route. As such, German political economists such as Gustav Schmoller (1884) complained that Germany stood in stark contrast to France, which by then had established a unified political system that brought with it unified economic and technical arrangements (such as a common measure system).

With Napoleon's invasion of Germany at the beginning of the eighteenth century, the conviction that political fragmentation led to national humility and economic underdevelopment had accompanied growing nationalism. An increasing common feeling among Germanic people helped Prussia establish a united German Kingdom in 1871.

Political and economic ambitions of the leaders of the new nation, Kaiser Wilhelm I and Chancellor Otto von Bismarck, gave way to a deliberate policy of industrialization and economic development. In fact, economic and industrial development prior to 1871 enabled Prussia to play a leading role among other German entities. David Landes (2003: 151) argues that the Prussian government's 'direct interest' in economic development was a demonstration of Prussian state's "passionate desire to organize and hasten the process of catching up" with Great Britain.

First in Prussia and then in unified Germany, industrialization, economic development, and military aggression went hand in hand. Moreover, rapid growth of certain industrial firms accompanied the process; the likes of Krupp, Siemens, AEG, and Thyssen grew in parallel with German economic development and in close relationship with the German state and banks. The German state directly and indirectly provided significant support for industrialization through a wide range of tools. Public procurement of industrial products (from Krupp armaments or rolling stock equipment to telegraph equipment of Siemens) from manufacturing companies provided market access to manufacturers. Cross-shareholding relationships between private firms and banks, which aided access to industrial finance, was a distinct characteristic of German economic development. Overall Germany's industrialization was not quite a free-market-based one.

Economic Unification, Patriotism, and Industrialization

In the first half of the nineteenth century, the *zollverein* (customs union among German states) was created in order to create a large marketplace for German firms to flourish. Behind the customs union was the

> relentless drive to emulation and economic development which could alone provide the necessary wealth for military and national safety, and behind the singularly un-capitalistic figures of those Prussian statesmen who created the customs union.[34]

Germany was a 'late developer;' a second-generation industrializer in comparison to England, Holland, or France, which were considered first generation. Until 1830s, the pace of industrialization in Germany, even in western Germany, was behind the rapid pace in France and Belgium:

> It was German economists and politicians who first developed the concept of 'backwardness.' Previously, economies had been thought of as either 'strong' or 'weak' states which could be changed. For example, by pursuing a wise economic policy, a 'weak' state could become 'strong.' After the industrial revolution in France and Belgium, it became more usual in Germany to think of the states of Europe as being strung out in a competitive race to a particular goal in which some were 'advanced' and some, including Germany, had become 'backward.' Such a conception, which has become part and parcel of economic jargon today, had a most powerful effect in Germany because it harnessed a tremendous driving force of patriotism and nationalism to the will to develop and to change the political shape of the country.[35]

Starting in the mid-eighteenth century, in addition to providing an enabling environment and developing physical infrastructure (especially railways in the nineteenth century), Prussian governments conducted industrialization policies, especially in the metallurgical and textile industries. The metallurgical industry was a priority because of military reasons.

The earlier policies, in the eighteenth century under Frederick the Great (Frederick II), undoubtedly helped the very rapid, though late, industrialization of Germany in the second half of the nineteenth century. An analogy can be made with Colbert's efforts at the end of the seventeenth century which helped the Industrial Revolution to begin in France prior to Germany.

The Prussian state directly established mining and metallurgical firms[36] and provided subsidies, low- or zero-interest credits, machinery grants, and other incentives to businessmen to found industries. German civil servants got involved in the supervision or direct administration of some companies.[37] Under Frederick II, who implemented a wide reform agenda in the bureaucracy, the judicial system, and the economy, the Prussian government founded two important metal works: the blast furnaces in Malapane in 1779 (*die königliche Eisenwerke zu Malapane* on the relatively far Silesian border) and in Kreutzburg (*Kreutzbürgerhütte*) in 1753.

He also provided incentives to Splitgerber and Daum firms for the development of metal and armaments industries in greater Brandenburg.[38] Silk was also a priority sector (Schmoller 1884); Frederick II provided privileges to Gotzkowsky to establish silk and porcelain industries in Berlin.

In the nineteenth century, the Prussian government undertook several other measures to accelerate industrialization. These included importing British machine tools and attracting British engineers to Germany to help German firms and masters to learn and to reverse-engineer, setting up vocational schools (Gewerbe-Institut), funding technical visits by engineers and technicians abroad, funding financial aids to students, funding expositions, and awarding subsidies to inventors and migrant entrepreneurs. Combined, these measures enabled the rapid development of German machine and machine tool industry and led to the establishment of the German steam locomotive industry. The ultimate objective of the Prussian government was to catch up with Great Britain.[39]

The education system played an important role in German industrialization by educating industrial manpower. As will be discussed more in Chap. 11, the German education system was specifically designed to build human resources loyal to Germany as well as useful for the manufacturing sector. It became a model for other countries, including the USA.

Germany as an Industrialized Nation

Germany is still one of the major industrialized countries in the world. The share of manufacturing in total gross domestic product (GDP) is among the highest in the world. Industrial production enables Germany to run large exports and trade surpluses. Its economy and exports are supported by its *Mittelstand* manufacturing companies. Its education system is still geared towards technological and industrial leadership.

4.5 Beginning of Russian Industrialization: Peter the Great's Great Technology Transfer Story in the Eighteenth Century

Peter I—or *Peter the Great* as Russians like to call him—was a reformer who paved the way for Russia to become an important player in international politics from an underdeveloped economy at the end of the seventeenth century. On the foundations he laid out, Russia, subsequently, became one of the world's superpowers after the eighteenth century.

In his agenda, economic development and industrialization (before the Industrial Revolution took place) were probably the most important items. For that, he personally led what can be called 'a state-led technology transfer process' in addition to reforms in other areas such as education.

Peter was interested in substantive reform—in addition to fame and glory. He was personally the driving force of reform; history does not record aiding reformers (such as Colbert to Louis XIV or Bismarck to Wilhelm I) or an elite bureaucracy in Russia. He personally introduced western clothes and styles, cartography, new tools, weapons, and fire extinguishers to Russia.[40] Quite impulsive in character, some of his decisions had long-standing negative effects on Russia. Peter bolstered the power of the central government, including his grip on the nobility. In turn, the agricultural feudality in Russia hardened, creating a wide dichotomy between the nobility and the serfs, who made up the majority of the population.

For Russia, as in the case of others such as the UK, Germany, France, or Japan, economic and military development went hand in hand. When Peter came to the throne, Russia was an underdeveloped and mostly landlocked country with only a small coastal line on the Baltic Sea and coasts on the Arctic Ocean. His ambition was to establish a strong military and maritime force out of this mostly landlocked country. After experiencing several defeats, his armies ultimately gained victory against Sweden and secured a longer coastal strip on the Baltic Sea. Then, Russia captured a coastal strip on the Black Sea, although it was severely defeated by the Ottoman Empire in 1711.

In fact, economic and industrial development was a tool for Peter's military and political ambitions. For sustained military superiority, Peter realized the need to reform not only the military administration but also the administrative organization, education, and industry. He must have seen earlier that he would need warships once his territories had extended to the seas. There may be many answers to the question of how to establish a fleet for a country which does not possess ships. An easy way would be to procure ships from shipyards abroad, but he took a rather more interesting and difficult course. Identifying Holland as the top country with a successful shipbuilding industry, he organized a personal visit to Amsterdam in 1697, at the age of 25. This was the start of an impressive technology transfer and capacity-building programme.

Peter's Crusade for Inward Technology Transfer

It was not a simple visit; impressively, the head of the country did not leave it to consultants but decided to self-train himself. Peter undertook an internship in a carpenter workshop in Zaandam (Amsterdam) under a pseudo-name. Soon identified as the tsar of Russia, he received attention and respect as well as having rubbish and stone thrown at him. Cutting his stay in Zaandam short, he moved to Amsterdam to work in the shipyards of the Dutch East India Company for four months. Not happy in the Dutch shipyards, as he did not find them 'methodological enough,' he paid a visit to English shipyards as well.[41]

Other than shipbuilding and related fields, he observed the Dutch windmills and he appreciated how they operated. A curious personality, he is said to have observed watch-making, making coffins, metal etching, paper making and silk spinning, gardening, book printing, medical operations, and even how to pull teeth, and he visited a dissection performed by Herman Boerhaave.[42]

Upon his return to Russia, he established naval academies (in Moscow in 1701, another in St Petersburg in 1715) and a ship construction programme by founding the Olonets shipyard in 1702. In 1703, the first Russian ship in history was built. As the programme unfolded and Russia's military and commercial fleet expanded, many metallurgical and sail textiles enterprises were also founded and soon Russia became an important producer of cast iron. Peter also started the School of Medicine in 1707 and School of Science in 1724 with the help of Dutch scientists. He also introduced the first museum in Russia based on the ideas and material and experts from Holland. Peter invited Nicholas Bidloo to settle in Russia in order to establish Russia's first hospital.

Russia as an Industrialized Nation

Russia continued its political and military ascendance in the subsequent centuries and became one of the superpowers of the world. No doubt, industrialization contributed significantly to its rise. Following the October Revolution in 1917, the regime and economic ideology changed. But even during the socialist administration, the will to industrialize continued.

At some point, there was considerable concern in the USA—the other superpower of the time—that the socialist USSR economy would take over that of the capitalist USA. The power game between the two had a major industrial and technological component, especially in the space and defence industries. Nevertheless, the USA was lucky that the USSR's socialist economic system did not provide sufficient incentives to its people to create long-term economic development. The USSR's economy simply did not allow private enterprise, which was the writing on the wall for the regime.

Following the collapse of the socialist regime a more liberal regime was introduced in the 1990s. However, the new regime also does not present a sustainable platform for ordinary business enterprises—especially small- and medium-size businesses—to flourish. The institutions of the new regime are not strong. Instead, under President Putin the Russian system mainly builds on an amalgam of the state and large-scale businesses (mostly based on privatized state enterprises) dominate the economy. Nevertheless, it is a major political and military power on the back of a resource-based economy and military industry acquired during the socialist period.

Notes

1. Bogart (1918: 59).
2. Powell (1913).
3. Bogart (1918: 62–63).
4. Bogart (1918: 61).
5. Bogart (1918: 155).
6. Bogart (1918: 148).
7. Bogart (1918: 106–107).
8. Freeman and Soete (1997) and Chambers (1961).
9. List (1841: 11).
10. Houchins (1995).
11. Dower (2013).
12. Shulman (2015: 79).
13. Shulman (2015: 79–80).
14. Ohno (2006).
15. During the high-growth period in the next century, more slogans were minted such as *obei ni oikose* ('overtake Europe and USA').
16. Sugiyama (2004).
17. Komiya and Itoh (1988), Forsberg (1998: 190).
18. Yokoi (2004: 102).

19. Abe (2004).
20. Abe (2004) explains in detail the establishment of the Osaka Spinning Company.
21. Ohno (2000).
22. Ohno (2006: 80–81).
23. Ohno (2006).
24. Ohno (2006).
25. Breward (2012), Chrisman-Campbell (2015).
26. Chrisman-Campbell (2015).
27. Lucassen et al. (2008).
28. List (1841).
29. Israel (1989: 308–9).
30. Sargent (1899: 30).
31. Sargent (1899), Israel (1989: 308–9).
32. Smith (2006: 21).
33. Graves (1964).
34. Milward and Saul (2013: 370).
35. Milward and Saul (2013: 367–368).
36. Henderson (1975).
37. Henderson (1975: 75).
38. Henderson (1963: 3).
39. Freeman (1995), Landes (2003).
40. Hermitage Amsterdam (2016).
41. Synge (1903).
42. Hermitage Amsterdam (2016).

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PART II

Manufacturing

CHAPTER 5

The *'Why'* of Manufacturing

Is there anything special about manufacturing? If so what is it? If there is anything special about manufacturing, then appropriate industrial policies supporting the naissance or growth of manufacturing—especially in developing countries—may have merit. This chapter discusses the merit of the manufacturing sector. It starts by reviewing a well-known trend, that of the falling share of manufacturing in total Gross Domestic Product (GDP, which measures the total value of production of all goods and services across the economy). If manufacturing is a 'good' sector, why does its share in total economic activity go down? We tackle the possible answers at the end of the chapter.

The chapter then examines 'which' countries manufacture? Using recent statistics, it identifies who manufactures and exports: Are they poor or rich countries? In other words, is manufacturing a poor man's business? Then, we examine the world trade. Trade is what enriches countries and drives growth. What, then, constitutes the world trade? Anything other than manufactures (exception is relatively small share of food and energy)? And any country other than the rich (the main exception is China)?

The link between the GDP growth and growth of manufacturing is then discussed. Backward and forward linkages of the manufacturing sector are the key to its social benefits. Lastly, the smile curve phenomenon is reviewed with a view to discern the level of (private) benefits from high- and low-value-added manufacturing.

M. A. Yülek, *How Nations Succeed*,
https://doi.org/10.1007/978-981-13-0568-9_5

5.1 The 'Fall' of Manufacturing

Let's start by reviewing a well-known trend. As per capita income rises in a country, the share of manufacturing in total output (GDP) first increases and then decreases. In the aggregated world economy, the share of manufacturing in total output went down from around 27% in the 1970s to around 17% after 2010. In developed economies, the share of manufacturing and overall industry in the GDP has steadily diminished over recent decades (Fig. 5.1). It currently ranges between 10% and 20%. In Germany and Japan, which are among the developed countries which are still 'manufacturing' nations, the ratio is close to 20%. In the USA, it is low; around 12%. Nevertheless, the fall in Japan and Germany is also illustrative; the share of manufacturing fell from 35% and 32% in the 1970s and went down to less than 25% and 20%, respectively, of the total output.

In developing countries, manufacturing has continued to increase its share in total output until recently, after which it started to fall (Fig. 5.2). In Brazil, the fall is prominent since the 1980s, and in Turkey since the 1990s. In Malaysia the fall started in the mid-2000s. In China, which is the largest manufacturer in the world, the fall—from high levels—is ongoing prominently since the mid-2000s, although the level is still high. In

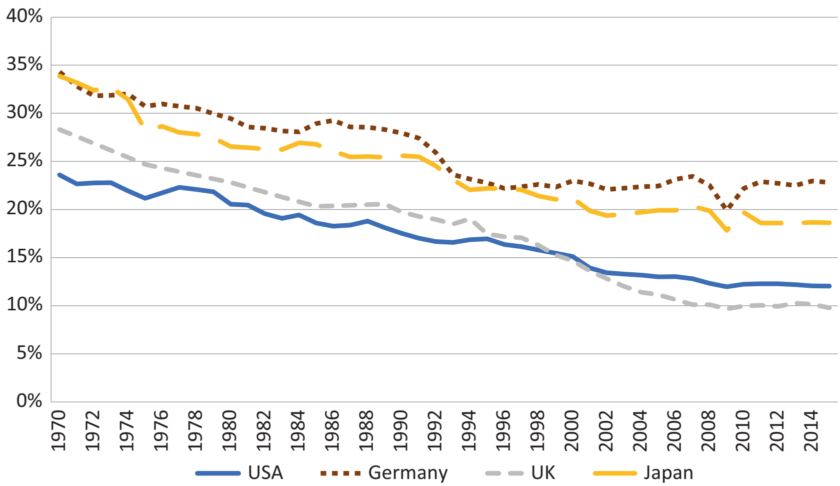


Fig. 5.1 Decline of manufacturing: selected developed economies (share of manufacturing in total output). (Source: World Bank)

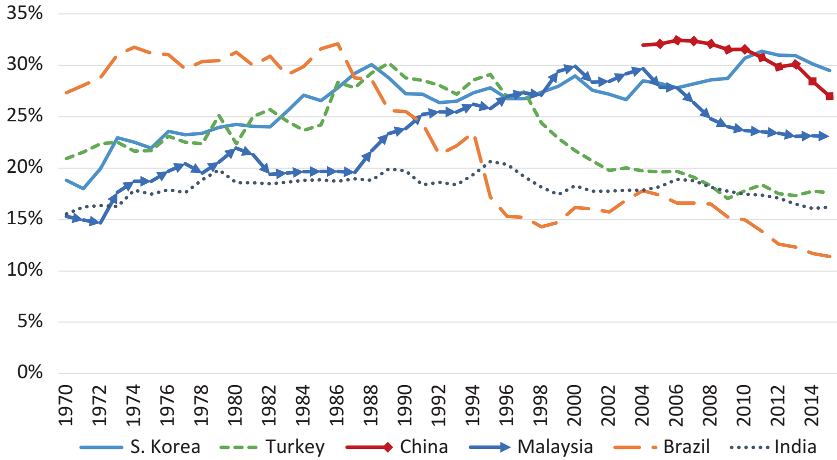


Fig. 5.2 Decline of manufacturing: selected developing economies (share of manufacturing in total output). (Source: World Bank)

India the share of manufacturing in GDP has been low (in the band of 15–20% of the total output) but not falling further; India seems to have experienced a premature industrialization earlier than other developing countries in contrast to its north-eastern peer China.

The share of manufacturing in total employment has diminished in parallel with its share in total output. In the USA, for example, the share of manufacturing employment in total went down from 40% in the 1940s to 8% in 2015 (Fig. 5.3). That was the result of two divergent trends. While total employment increased from 38 million in 1940 to 145 million in 2015, manufacturing employment went down from 12.8 million to 12.2 million (after reaching the 19 million bars in the 1970s). So, in the USA, the fall in manufacturing employment is apparent not only in terms of its share but also in terms of absolute numbers.

The falling share of manufacturing in total output and similarly falling numbers of manufacturing employment led to the arguments of 'de-industrialization.' In the developing economies, the turning point from rising to falling share of manufacturing has been named 'premature de-industrialization'; that is, the share of manufacturing started to fall much earlier than expected. In Fig. 5.2, the turning points for selected developing countries are apparent.

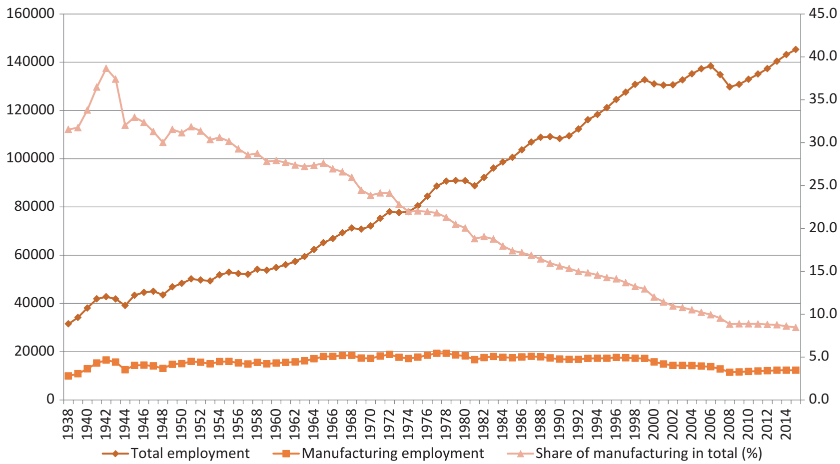


Fig. 5.3 Manufacturing employment in the USA. (Source: Bureau of Labour Statistics. Employment data is seasonally adjusted)

In the USA, 2016 presidential elections gave way to Donald Trump becoming the 44th president of the country, supported by his campaign arguments of de-industrialization and his policies to increase domestic industrial production. So, industrialization and de-industrialization continues to be a topic of heated public discussion even in the richest countries of the world. In fact, as we will see in a moment, the USA is still by far a huge industrial economy.

5.2 Is Manufacturing a Poor Man's Business?

The falling trend in manufacturing's share in output and employment, especially in the developed economies, led to a widespread misconception among some economists and decision makers (i.e. statesmen): that manufacturing was a poor man's business or something similar. In more official words, the misconception goes as follows: As countries develop, they get away (or, rather, they *have to* get away) from manufacturing.

This misconception seems even to lead the decision (policy) maker to wrongly feel that if the country is to prove that it is now richer, its statistics have to show low production of manufacturing and high production of services.

This is in a way more dangerous, as this may involve the *level* of production rather than its *share* in total output. The immediate question is why this happens. There may be a number of explanations and they will be taken up in a subsequent section of this chapter, while the remainder of this section will look at the relationship between manufacturing value added and per capita GDP. The former, the manufacturing value added, is defined as the addition of value by the manufacturing firms on their primary inputs such as agricultural or mining products. A simple example is an iron smelter transforming iron ore into iron bars. Manufacturing sector comprises firms that produce subsequent products in the value chain. Iron ore is transformed into steel in the steel factory and steel is transformed into cars in the automobile plant. Thus, during all those stages, manufacturing firms 'add value' to the inputs they receive while transforming them into their final products. Manufacturing value added in a country is the sum of all the added values by manufacturing firms in a year in the country. Thus, it is a good indicator of the level of production of the manufacturing industry.

The latter, per capita GDP, is the total production value of goods and services in the country per head, which is equal to the average income generated by the productive factors in the country. Thus, a country with a higher per capita GDP is one which is able to produce more income for its citizens. Unless an economy is dominated by natural resources, higher per capita income means a more complex and possibly a more diversified one.

Thus, a positive association between per capita income and manufacturing value added would indicate that manufacturing is the business of the rich men (country) not the poor, and vice versa. Figure 5.4 confirms this conjecture of a positive relationship. Richer countries (those with higher per capita income) are bigger manufacturers.

That may be considered a natural result of numbers rather than a surprise. High per capita income may point to a larger economy given the population, and in a large economy, the (added) value of production of manufactured goods is likely to be high anyway even when the share of manufacturing in total output has declined.

This is a valid objection requiring further evidence for our hypothesis. A good second indicator can be per capita manufacturing value added (i.e. total manufacturing value added in the country divided by the country's population). If manufacturing is a poor man's activity, in a rich country, per capita manufacturing value added should be small. Table 5.1 ranks world countries in terms of per capita manufacturing value added.

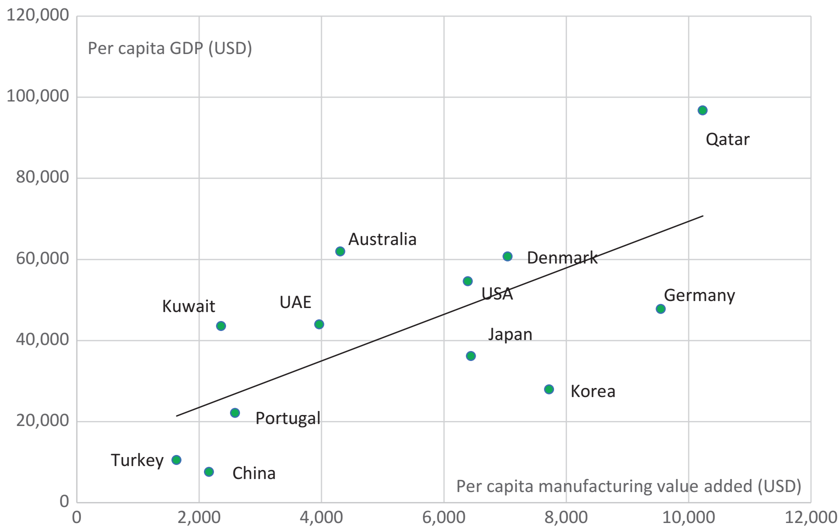


Fig. 5.4 Manufacturing and per capita income: selected countries. (Source: IMF [WEO] and World Bank [reproduced from PGlobal, 2016])

Disregarding smaller and resource-based countries[1] at the top of the list, Switzerland is the most industrialized country in the world. The top 20 countries consist entirely of rich countries. Per capita manufacturing value added, however crude, is probably the most meaningful indicator of the level of industrialization of a country available. A visual scan of the table shows that the industrialized countries are generally the rich ones, supporting our earlier conclusion.

Another interesting ranking can be on total manufacturing value added. Table 5.2 shows that China, the USA, Japan, Germany, and South Korea are the largest manufacturers in the world. Top manufacturers in the world are mostly rich countries. The USA, which has faced long debates of 'de-industrialization,' is the second largest manufacturer in the world in nominal terms. Thus, the USA, the largest economy in the world (with a high per capita income), has actually not abandoned manufacturing at all—despite low share in total GDP. China, the second largest economy in the world, which is now a middle (per capita) income country, is the largest manufacturer in the world.

Table 5.1 Industrialization ranking of countries (2014)

Rank	*Country*	*Per capita manufacturing value added ($)*	*Per capita GDP ($)*
1	Switzerland	15,903	86,606
2	Ireland	11,038	55,899
3	Singapore	10,038	56,336
4	Germany	9893	48,043
5	Qatar	8809	86,853
6	Sweden	8647	59,180
7	Austria	8569	51,733
8	Korea, Rep,	7645	27,811
9	Japan	7505	38,096
10	Denmark	7418	62,549
11	Finland	7265	49,915
12	Brunei Darussalam	6698	41,531
13	Norway	6604	97,200
14	United States	6499	54,599
15	Belgium	5956	47,379
16	Luxembourg	5935	119,225
17	Iceland	5628	52,473
18	Netherlands	5350	52,157
19	Canada	5007	50,440
20	Italy	4925	35,397
21	New Zealand	4873	44,503
22	Slovenia	4787	24,202
23	Czech Republic	4775	19,745
24	Israel	4544	37,540
25	France	4353	42,955
25	United Kingdom	4143	46,783

Source: World Bank (World Development Indicators)

On the other end of the spectrum, take Switzerland, an industrialized and rich country; while Switzerland is generally considered as a chocolate, tourism, and banking nation, it is actually among the most industrialized countries in the world. So is Holland; another small but rich country.

5.3 World Trade and Manufactures: What Do Rich and Poor Countries Export?

Trade drives incomes. International trade provides livelihoods to many people. More importantly, firms in exporting countries generate employment and value added by producing more than their countries' population

Table 5.2 Largest manufacturers of the world (2015)

Rank	*Country*	*Manufacturing value added (billion $)*
1	China	3250
2	United States	2142
3	Japan	892
4	Germany	700
5	Korea, Rep.	374
6	India	315
7	Italy	262
8	United Kingdom	258
9	France	250
10	Mexico	204
11	Brazil	182
12	Indonesia	180
13	Russian Federation	168
14	Spain	154
15	Turkey	143
16	Switzerland	121
17	Thailand	110
18	Ireland	99
19	Australia	85
20	Argentina	85

Source: World Bank (World Development Indicators)

can buy. On the importing side, people get access to goods which are more competitive (in price or features) than those locally produced, indicating a positive impact on their welfare.

Macroeconomic sustainability requires a country to balance its international trade at least over the long run. This can happen by building the capacity to increase competitive exports to the world. More than half of world trade comprises manufactured materials (Table 5.3). For countries seeking exporting opportunities (and lacking abundant natural resources and primary goods) the only way to achieve sustainability in international trade is building competitiveness in manufacturing industries.

The export pattern of a country reveals a lot of things about the sophistication of its economy. Three economists, Ricardo Hausman et al. (2007), contend that the products exported by higher-income countries should be more sophisticated than those exported by middle- or low-income countries. If a product is exported by a high-income country, its companies must be making more money even after paying high salaries to employees

Table 5.3 Composition of world exports (2015)

	Value ($ billion)	*%*
Merchandise	15,464	76
Of which manufactured goods	11,289	55
Services	4808	24
Total world exports	20,272	100

Source: WTO (World Trade Statistical Review 2017)

and bearing other costs than those in low-income countries. In other words, those are 'worthwhile' products specialized in by high-income countries.

So, what do high-income countries export? And what do middle- and low-income countries export? Tables 5.4, 5.5 and 5.6 show the following:

- High-income countries primarily export three categories of products: electrical and non-electrical machinery, chemical products, and transport equipment (automobiles, locomotives, tramways and railway rolling stock, ships, boats, etc.). Combined, these product categories constitute typically around 40–60% of total exports. Their exports show that these economies are not dependent on their natural resource base.
- Low-income countries primarily export primary and resource-based products (such as basic agricultural and food products, fuels [refined or unrefined], minerals and metals, wood, etc.) and textile and clothing products. Exports of these countries almost fully depend on their natural resource base.
- In high- to middle-income countries an important export item is machinery, but its total value and share in total exports are not as high as in high-income countries. Exports of these countries show that their economies are still somewhat dependent on their resource base.
- In low-income countries, exports are constituted by primary products (agriculture, minerals, etc.) as well as some manufactured products (textiles, machinery, etc.). In countries such as India and Egypt, chemicals also represent some respectable share in exports. Depending on the country itself, there is still a significant amount of dependence on the natural resource base.

Table 5.4 Exports of selected high-income countries (2013–2014)

		Countries								
		Belgium	*Denmark*	*France*	*Germany*	*Italy*	*Japan*	*S. Korea*	*United Kingdom*	*USA*
Product group (HS 1988/92)	01–05_Animal	2.2	10.3	3.0	1.7	1.3	10.3	0.3	1.6	1.9
	28–38_Chemicals	22.8	11.2	15.1	12.2	9.7	11.2	6.9	13.3	10.1
	16–24_FoodProd	4.9	6.8	6.6	3.0	4.9	6.8	0.7	4.1	2.8
	64–67_Footwear	1.2	0.7	0.6	0.4	2.4	0.7	0.1	0.5	0.1
	27–27_Fuels	11.4	6.6	3.9	2.7	3.7	6.6	9.7	10.8	9.6
	41–43_HidesSkin	0.4	1.6	1.4	0.3	2.9	1.6	0.3	0.4	0.4
	84–85_MachElec	10.2	23.0	19.3	26.4	25.9	23.0	34.6	20.2	23.7
	72–83_Metals	7.1	6.0	6.9	7.5	9.7	6.0	8.2	5.6	4.9
	25–26_Minerals	0.6	0.2	0.2	0.2	0.3	0.2	0.1	0.2	0.7
	90–99_Miscellan	7.0	16.6	7.8	11.8	8.4	16.6	7.4	9.5	17.7
	39–40_ Plastic&Rubber	8.0	2.8	5.1	5.3	5.0	2.8	7.1	3.2	4.8
	68–71_StoneGlas	5.9	1.0	2.3	2.0	4.8	1.0	1.1	11.1	4.7
	50–63_TextCloth	3.3	4.9	2.9	2.3	6.9	4.9	2.8	2.6	1.6
	86–89_Transport	10.1	3.4	19.0	20.6	9.5	3.4	19.8	14.3	9.6
	06–15_Vegetable	2.8	2.6	3.5	1.2	2.4	2.6	0.2	0.9	4.8
	44–49_Wood	2.2	2.2	2.3	2.6	2.3	2.2	0.7	1.9	2.5
	01–99_All Products	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source: World Integrated Trade Solutions Database 2016

Table 5.5 Exports of selected middle-income countries (2013–2014)

		Upper-middle income countries						*Lower middle income countries*		
		Brazil	*China*	*Malaysia*	*Mexico*	*South Africa*	*Turkey*	*India*	*Indonesia*	*Egypt*
HS 1988/92 Product Group	01–05_Animal	7.8	0.8	0.6	0.9	1.2	1.4	3.5	2.0	1.8
	28–38_Chemicals	5.1	4.7	4.3	2.8	6.3	3.3	10.5	4.8	11.6
	16–24_FoodProd	11.6	1.2	2.8	2.7	4.4	4.8	2.1	3.6	5.0
	64–67_Footwear	0.6	3.0	0.1	0.2	0.3	0.5	1.0	2.5	0.1
	27–27_Fuels	9.2	1.5	22.1	10.6	10.5	3.7	19.6	29.1	23.4
	41–43_HidesSkin	1.4	1.5	0.1	0.2	0.5	0.6	1.2	0.3	0.7
	84–85_MachElec	7.5	41.4	37.9	35.3	10.1	14.8	7.1	8.9	8.2
	72–83_Metals	7.2	7.9	4.9	4.4	13.1	13.2	8.1	5.3	7.2
	25–26_Minerals	13.0	0.2	0.5	1.3	13.5	2.5	1.1	1.2	1.5
	90–99_Miscellan	3.2	9.8	5.3	7.7	2.0	4.4	1.8	2.3	2.7
	39–40_PlastiRub	2.5	3.9	6.2	2.8	2.4	5.5	2.6	5.6	6.6
	68–71_StoneGlas	2.1	4.8	1.9	2.9	16.0	7.1	13.7	3.2	6.3
	50–63_TextCloth	1.1	12.3	1.5	1.8	1.4	18.4	12.2	7.2	11.3
	86–89_Transport	7.2	4.5	1.4	22.9	10.7	12.6	8.2	3.4	0.5
	06–15_Vegetable	16.5	0.9	8.1	2.9	5.3	5.3	6.8	15.2	11.3
	44–49_Wood	4.3	1.7	2.4	0.7	2.5	2.0	0.6	5.5	1.9
	01_99_All Products	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source: World Integrated Trade Solutions Database 2016

Table 5.6 Exports of selected low-income countries (2013–2014)

		Benin	*Cambodia*	*Madagascar*	*Mali*	*Mozambique*	*Nepal*	*Niger*	*Uganda*	*Zimbabwe*
HS 1988/92 Product group	01–05_Animal	1.1	0.0	5.9	4.5	1.1	1.4	1.6	6.5	0.3
	28–38_Chemicals	0.8	0.0	2.8	6.5	1.5	4.8	0.1	3.5	0.6
	16–24_FoodProd	2.1	1.2	7.4	0.4	11.6	9.5	3.7	16.0	29.5
	64–67_Footwear	0.0	4.1	0.1	0.0	0.4	3.4	0.0	0.2	0.1
	27–27_Fuels	10.9	0.0	4.5	0.6	33.5	0.0	27.0	6.4	1.0
	41–43_HidesSkin	0.0	0.2	1.1	0.8	0.0	1.8	0.0	2.7	1.0
	84–85_MachElec	11.8	3.0	1.3	2.1	2.7	0.6	2.0	5.4	0.8
	72–83_Metals	8.3	0.4	23.6	0.8	28.2	17.1	0.0	6.3	18.7
	25–26_Minerals	4.5	0.0	7.0	0.6	4.0	1.1	45.9	4.5	11.4
	90–99_Miscellan	1.6	0.5	1.5	0.3	1.7	5.9	9.2	2.4	1.1
	39–40_PlastiRub	0.3	2.2	0.3	0.2	0.2	2.0	0.1	1.5	0.5
	68–71_StoneGlas	2.3	0.1	1.4	65.8	0.0	0.8	0.0	0.8	27.8
	50–63_TextCloth	31.9	55.2	24.9	15.0	2.7	38.5	3.0	2.2	3.6
	86–89_Transport	11.2	4.5	2.4	1.3	6.9	0.0	1.0	4.4	0.8
	06–15_Vegetable	11.8	3.2	13.8	1.1	4.1	11.8	6.3	35.4	1.8
	44–49_Wood	1.4	25.3	1.9	0.1	0.1	1.5	0.1	1.7	1.2
	01_99_All Products	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source: World Integrated Trade Solutions Database 2016

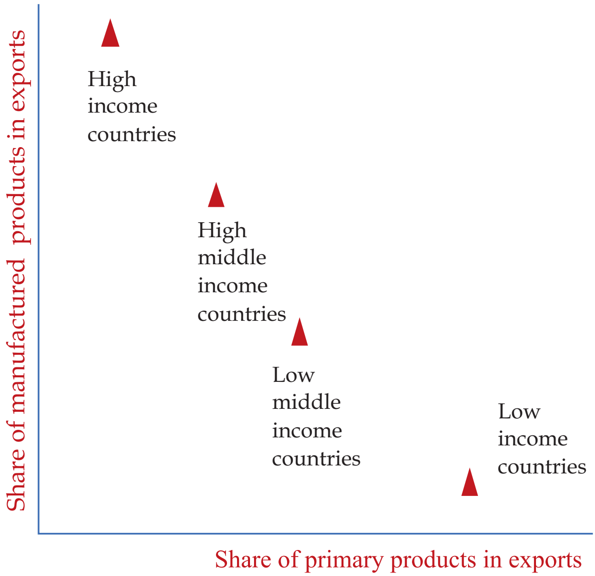


Fig. 5.5 Export sophistication ladder

The upshot of the exercise is simple; as the average income level of the country goes up, the country more and more becomes an exporter of manufactured products. This is akin to a 'sophistication ladder' (Fig. 5.5). As the sophistication of a country's economy increases, it exports more and more manufactured goods.

The conclusion that follows from this section is simple; manufacturing is generally the business of richer countries. Richer, more developed countries export automobiles, airplanes, and electrical, electronic, and mechanical machinery and devices. Indeed, the top ten exporters of manufactured goods which source 82% of total world exports of such products mostly comprise developed economies such as the European Union (EU) countries, the USA, Japan, Singapore, and Canada (Table 5.7).

5.4 Manufacturing and Growth[2]

Nicholas Kaldor (1966, 1967, 1975), a well-known Cambridge economist, has described the manufacturing sector as the engine of growth. According to him, the manufacturing sector not only enjoys higher

Table 5.7 Top ten manufactured goods exporters of the world (2015)

	Value (billion USD; 2015)	*Share in world exports of manufactured goods (%)*			
		1980	*1990*	*2000*	*2015*
European Union (28)	4239	–	–	43.0	36.6
Extra-EU (28) exports	1601	–	–	14.1	13.8
China	2153	0.8	1.9	4.7	18.6
USA	1126	13.0	12.1	13.8	8.7
Japan	545	11.2	11.5	9.6	4.7
S. Korea	470	1.4	2.5	3.3	4.1
Hong Kong, China	437	–	–	–	–
Domestic exports	5	1.2	1.1	0.5	0.0
Re-exports	432	–	–	–	–
Mexico	312	0.4	1.1	3.0	2.7
Singapore	266	0.8	1.6	2.5	2.3
Chinese Taipei	240	1.6	2.6	3.0	2.1
Canada	208	2.7	3.1	3.7	1.8
Top ten exporters	9445	–	–	87.0	81.6
World exports of manufactured goods[a]	11,572	100.0	100.0	100.0	100.0
Memo: World merchandise exports	16,482				

Note: [a]WTO statistics for manufactured products exclude the large export items of manufactured arms and armaments

Source: WTO (World Trade Statistical Review 2016)

productivity growth rates but also drives up productivity in service and agricultural sectors.

Kaldor's three laws have been formulated as follows[3] (order changed purposefully):

- The second law of Kaldor: Productivity drives the growth of the manufacturing sector; also known as Verdoorn's (1949) law.
- The third law of Kaldor: The productivity of the non-manufacturing sector is positively related to the growth of the manufacturing sector.
- The first law of Kaldor: The manufacturing sector is the engine of GDP growth.

Kaldor's ideas can be summarized and extended to classify the manufacturing sector as the hotbed of productivity growth and causality running from growth in the manufacturing sector to others (Fig. 5.6).

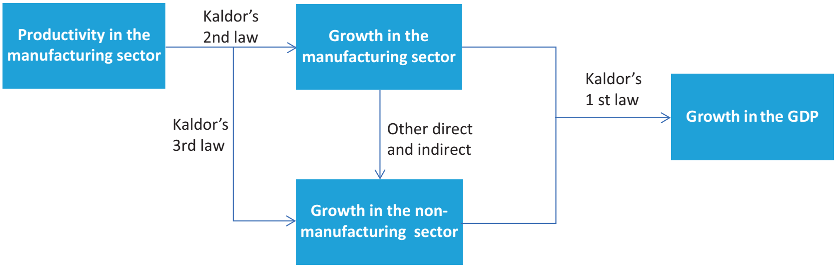


Fig. 5.6 Manufacturing and growth. (Source: Yülek 2017)

Manufacturing is the pioneering driver of growth; it is the sector in which the productivity and its growth are relatively high and which raises the growth of the sector. That in turn leads to productivity increases (and hence growth) and growth in the non-manufacturing sector, importantly including services.

Growth effects of manufacturing have been the subject of numerous research studies at the national and regional levels.[4] The results of research generally confirm the growth effects of the manufacturing sector.

The fact that productivity growth is high in the manufacturing sector is one of the prime reasons for the secular trend of a falling share of the sector in total GDP and total employment in countries with higher per capita GDP figures. The share of manufacturing in the GDP probably will converge to a certain level in richer countries. In the USA, for example, where a popular and academic discussion on 'de-industrialization' exists, the share of manufacturing in the GDP has been resilient in the recent decades (Baily and Bosworth 2014); moreover, the USA is the second largest manufacturer in the world. This level may be different in different countries enjoying different conditions and policies.

Prices of services are less sensitive to GDP growth, while unit prices of manufactured goods tend downward. Consequently, economic research has documented secularly growing relative prices of services with respect to manufacturing goods. This can be due to higher productivity growth in the manufacturing sector[5] and higher tradability of manufactured goods compared to most services, which are generally non-tradable (the Balassa-Samuelson theorem). The fact that most manufactured goods are not differentiated products is also likely to play a role.

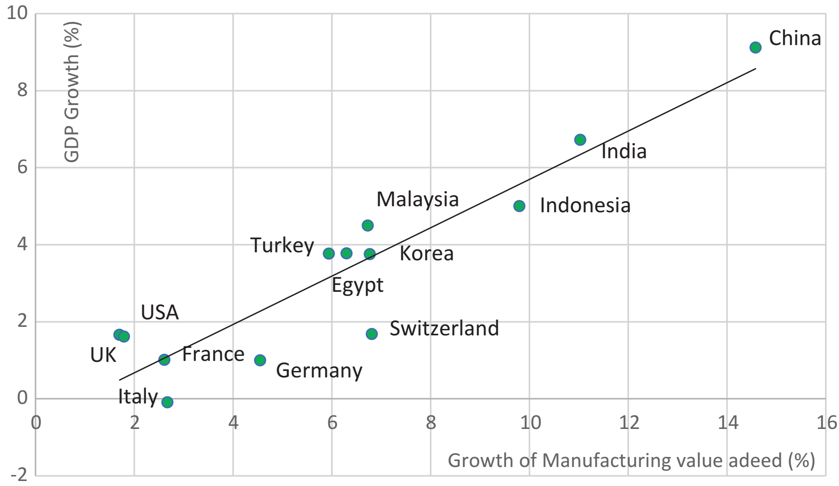


Fig. 5.7 Growth of manufacturing and growth of GDP (2000–2014). (Source: IMF [WEO] and World Bank [reproduced from PGlobal, 2016])

Following this brief discussion, it can be said that manufacturing can contribute to the growth performance in both developed and developing economies. In developing economies, through both capital accumulation and productivity gains, the manufacturing sector can increase the GDP growth rates. In developed economies, manufacturing can still play the role of a growth engine through overall total factor productivity (TFP) growth as well as supporting growth in the backward regions.[6]

Figure 5.7 shows the relationship of average growth manufacturing production and GDP over the period of 2000–2014. The figure does not necessarily indicate causality running from manufacturing to overall GDP. However, the selected nations, including developing as well as developed economies, indicate that there is an obvious association between the growth of manufacturing and overall income.

5.5 Linkages of the Manufacturing Industry

The concept of forward and backward linkages of a firm or a sector put forward by the economist Alfred Hirschman is well known. Along the value chain, a firm (or a sector) receives raw or intermediate inputs from

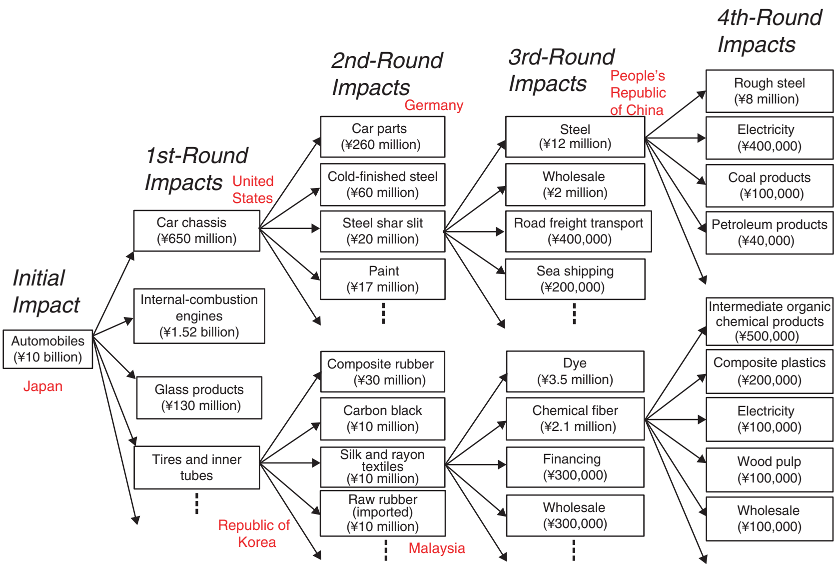


Fig. 5.8 Automobile manufacturing: backward linkages and value-added generation. (Source: Inomata 2013)

other firms (and sectors). Forward linkages refer to the firms (or sectors) receiving inputs from the firm (or sector) in question; backward linkages are firms/sectors that supply inputs to the firm. The forward and backward linkages determine the impact on sectoral production following an increase in the final demand; depending on the international supply chain, the impact may go beyond the national borders. Figure 5.8 presents the estimations of backward linkages for an increase in the final demand for automobiles in Japan for an equivalent of 10 billion yens.[7]

With a further tool—Wassily Leontief's input-output methodology—one can quantify the intersectoral flows of economic value and thus the backward and forward linkages of each sector. Such quantifications allow the calculation of 'multipliers,' showing how much the production in a sector triggers production in other sectors. Likewise, they show how much an increase in final demand for a sectoral product triggers the production of supplying sectors (in terms of value added), on a dollar-for-dollar basis.

Manufacturing has strong backward linkages and thus high multiplier effects. That is, an increase of $1 in the final demand of manufactured

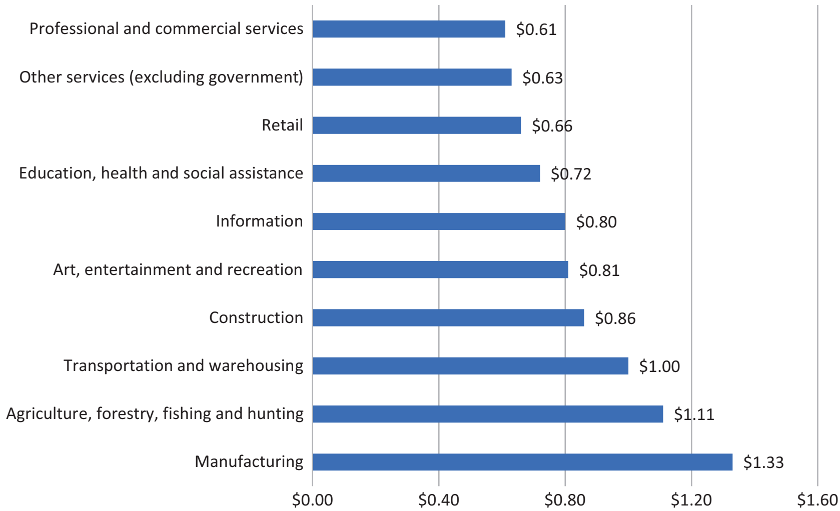


Fig. 5.9 Multiplier effects in the USA (change in the total output in response to a $1 change in final demand for the product of the sector, 2012). (Source: U.S. Bureau of Economic Analysis, Annual Input-Output Tables, Manufacturing Institute)

goods generates a high increase in the total output. A study[8] revealed that in the USA an increase of $1 in the ultimate demand for manufactured goods generates $1.33 of increase in total output. For agriculture the multiplier is $1.11 and for retail sector it is calculated as 0.86 (Fig. 5.9). In general, the multiplier for the manufacturing sector is significantly higher than for the service sector. This is how East Asian countries recorded very high growth rates in recent decades; increasing global demand for manufactured products helped these countries, as they concentrated on the production and exports of manufactured goods such as electronics, automobile, and ships.

Moreover, some manufacturing subsectors have higher multiplier effects than others. Thus, higher demand for their products triggers production in other subsectors. That implies that increased production in those subsectors generates higher 'social returns' (economic return to the entire society) than immediate private returns (economic returns to the firm or the subsector). As we will see in Chap. 12, this can be an important factor in the selection of economically 'strategic' sectors in industrial policy.

In countries where domestic suppliers of manufacturing products are strong, the multiplier for the manufacturing sector is higher. Where domestic manufacturing suppliers are weak, manufacturing imports lead to lower multipliers. In Cambodia, for example, a study[9] found "positive and statistically significant backward links for the services sector, but we did not notice statistically significant backward linkages for the manufacturing sector. This is likely due to the lack of strong domestic industries to form linkages with multinationals."

5.6 Why Then Does the Share of Manufacturing in Output Falls as Economies Grow?

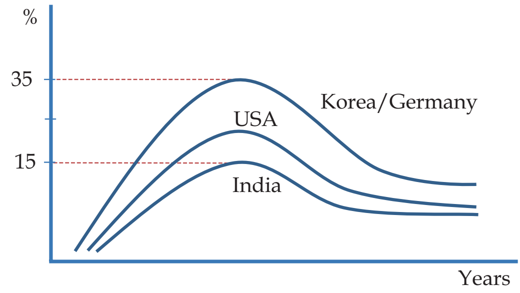
> It is an obvious truth, which has been taken notice of by many writers, that population must always be kept down to the level of the means of subsistence; but no writer that the Author [Thomas Malthus] recollects has inquired particularly into the means by which this level is affected: and it is a view of these means which forms, to his mind, the strongest obstacle in the way to very great future improvement of society. (Thomas Malthus[10])

That economics is a 'dismal science' is a view attributed to Malthus, an early economist. Living at a time when the British population exploded, and noticing that the size of arable land was finite, he argued that the production of food could not keep up with the growth of population. Time proved him wrong; agricultural productivity increased quite impressively; increasing population led to increasing food production. And economics became a quite 'joyful' science, if it can be called a science and not debating its use and precision.

How about manufacturing? Let's come back to the question at the beginning of this chapter: Why does the share of manufacturing fall as per capita income rises after a threshold in development is surpassed? And does that mean that the importance of manufacturing is diminished?

It is apparent from the experience of developed and developing economies that the share of manufacturing in total output in a country shows a hump shape over the course of economic development (Fig. 5.10). It starts at a relatively low level when industrialization starts and proceeds to peak to a level, after which it starts to fall or flatten. In countries like Germany or South Korea, the peak has been higher and more long-standing than others. In countries like India, the peak has been low and shorter—deserving the claims of premature de-industrialization. That is,

Fig. 5.10 Share of manufacturing in total output over the course of economic development



in some developing countries, manufacturing started to fall before it reached the usual peak levels (in terms of share in output or employment) in the history of other nations.

Why does this inverse-U-shaped course of manufacturing happen then? One plausible explanation using a Kaldorian framework may be as follows. As industrialization starts and intensifies, productivity of the labour within the manufacturing rises, pushing up average productivity and thus income in the overall economy. At the same time, mechanization (mainly through imported machinery and equipment) pushes up the productivity in the agricultural and service sectors. More industrialization also generates managerial and blue-collar skills that spill over to the non-manufacturing sectors (agricultural and more importantly to the services). This is an additional factor in the increase in overall productivity in the economy. Thus, high productivity growth in manufacturing tends to increase the supply beyond the growth of the needs of the people. Think of Apple and Samsung introducing major new models every six months to a saturated global market. Less and less manufacturing workers can meet the demand of billions of people.

So, the share of employment in manufacturing tends to go down, while the supply of manufactured goods increases. In the USA, while manufacturing employment fell to about 12 million in 2015 from about 19 million in 1970s and the peak of more than 20 million in the late 1970s, manufacturing output increased seven times in real terms between the 1950s and 2015 (Figs. 5.11 and 5.12).

At the same time, production of more manufactured (and agricultural) goods gives way to more services, which may become more and more sophisticated. In time, mechanization (some imported, some local) in the non-manufacturing sectors ushers in a faster transfer of employment to

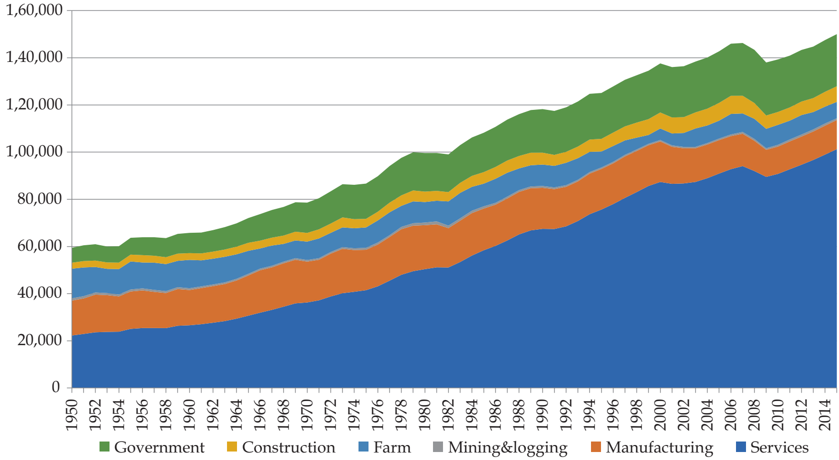


Fig. 5.11 Evolution of employment in the USA (1950–2015; seasonally adjusted). (Source: Bureau of Labour Statistics)

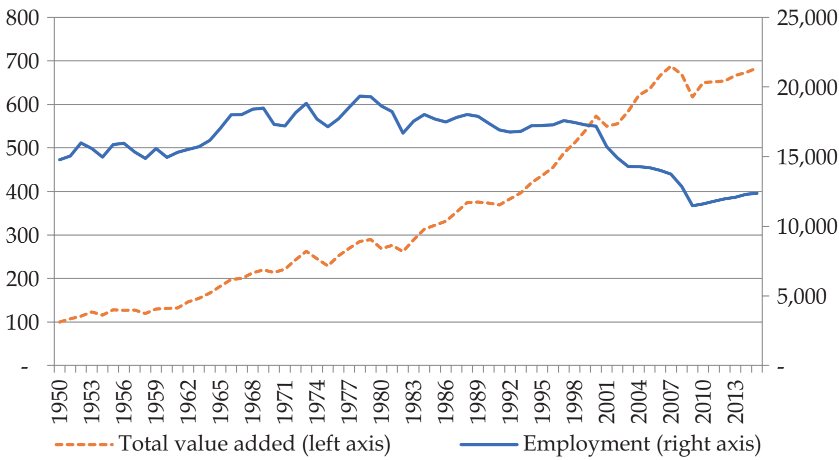


Fig. 5.12 Employment and real output in the US manufacturing sector. (Source: Bureau of Labour Statistics and Bureau of Economic Analysis)

those sectors. Thus, at more developed stages of an economy, the same real amount of manufacturing production leads to higher and higher amounts of services output and employment.

It is important to note that the growth of productivity in the non-manufacturing sector continues to remain largely behind that of the manufacturing sector. That has been the case even in the USA, a quite developed economy, during the last three decades (Table 5.8). One reason for this is that innovations that we know of largely concern the manufacturing sector either directly or indirectly.

So, as the economy becomes more and more sophisticated, manufacturing remains the hotbed of productivity and innovation and services become and remain hotbeds of employment. The employment in the manufacturing sector continues to go down (at a slower pace), approaching to a band of 10–15% (Table 5.9).

Table 5.8 Productivity in non-farm services and manufacturing sectors in the USA

	Services sector	*Manufacturing sector*
1990–2000	2.2	4.1
2000–2007	2.6	4.7
2007–2016	1.1	1.7[a]

Note: [a]2007–2015

Source: Bureau of Labour Statistics https://www.bls.gov/lpc/prodybar.htm (last accessed 17 February 2017)

Table 5.9 Employment and output by major sectors in the USA (2015)

	Employment (million)	*Output ($ thousand)*	*Output/employee ($ thousand)*
Manufacturing	12.4	2170	175.60
Services	101.3	12,293	121.41
Agriculture	6.9	175	25.23
Government	22.1	2338	105.80
Mining	0.7	328	441.18
Construction	6.6	732	110.46
Total	150.0	18,037	120.22

Source: Bureau of Economic Analysis, Bureau of Labour Statistics and the author's calculations

This is what we have seen so far in different industrialized economies. But it is likely that combined shares of the primary sector (agriculture, forestry, minerals, and fuels) and the manufacturing sector (perhaps including also construction) may ultimately fall to 10%. A study of the economic impact of fashion in the UK showed that value of manufacturing in total bill to consumers constituted around 10% only. The rest is the share of all services that relayed the product to the consumer.[11] In other words, 10 units of manufacturing output have given way to 90 units of services output in the British fashion industry.

The plausible policy prescription is that the services sector can be used to drive employment, and manufacturing can be used to drive growth, productivity, and innovation. In the earlier stages of development, manufacturing becomes a destination for otherwise unproductive labour in addition to pushing overall labour productivity up. In the later stages of development, the value of manufacturing as a source of employment diminishes vis-à-vis services, although continuing as a source of productivity and innovation. At these stages, services take over as the more important source of employment.

So, the decision on the 'mix'—how much manufacturing versus how much service to encourage—should be based on the stage of the development and the needs of the economy. In Hong Kong, a small high-income country, manufacturing has a very small share in total output (in the order of 2%). In Singapore, a similar small economy, the share of manufacturing is much higher at 20% of GDP as a result of a deliberate policy decision.

A manufacturing sector is critical if a country is to reach or break out of the middle-income trap. Beyond the middle-income level, high-wage employment would become a more important policy goal. The manufacturing industry can also help reduce regional economic growth differences and discrepancies.[12] The relationship between manufacturing, industrial policy, and the middle-income trap will be discussed in more detail in Chap. 11.

5.7 The Smile Curve and the 'New' Product Cycle: Does *All* Manufacturing *Always* Make Money?

Not all manufacturing always makes good money for the manufacturer. For example, subcontracting manufacturers, whether of automobiles, mobile phones, or apparel, make pennies, while the bulk of the profits accrue to the principal. In other words, if not combined with a *monopolistic*

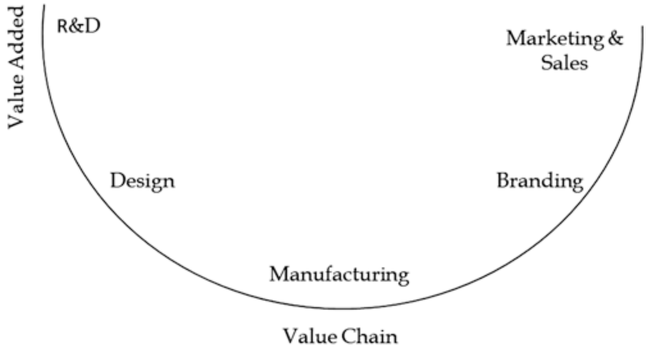


Fig. 5.13 The smile curve

competition strategy, including product differentiation, proprietary technology, or a patent protection, manufacturing may generate relatively low value. This phenomenon has been named the *smile curve* (Fig. 5.13) by Stan Shih, the founding CEO of the Taiwanese IT company *Acer*. Some research studies have confirmed Shih's view.[13]

The smile curve can be considered as a *progression curve* that describes value generation along the process of developing, designing, branding, manufacturing, marketing, and selling a product. It implies that manufacturing an *undifferentiated* product that is invented, developed, and designed (and/or marketed) by third parties may yield very little to the manufacturer (assembler) and to the economy. The reason is simple; this manufacturer is either a producer or an assembler—among many others—of a *standard* (*undifferentiated*) product. In either case, a producer of an undifferentiated product cannot command a 'non-zero' profit in its market, as raising its price will lead its clients to momentarily shift to one of its many competitors.

An illustrative example is the manufacturing costs of Apple iPhone 6s 16GB NAND flash memory. Launched in 2015 and sold for $749[14] it was assembled by Foxconn (China), which is still one of the largest electronics companies of the world, with over 1.3 million employees. Foxconn received only 0.6% of total manufacturing cost against the assembly (Table 5.10). In 2013, Foxconn employed 1 million people worldwide and manufactured 500,000 iPhones in only one of its facilities in China (Zhengzhou).[15]

Table 5.10 Manufacturing costs of Apple iPhone 6s 16GB NAND flash memory

Component	*$*	*% of bill of materials*	*% of launching price*
NAND Flash + DRAM	15	7.0	2.0
Display and touchscreen	52.5	24.4	7.0
Processor-AP	20	9.3	2.7
Camera(s)	12.5	5.8	1.7
Wireless section – BB/RF/PA	33	15.3	4.4
User interface and sensors	22	10.2	2.9
BT/WLAN	4.5	2.1	0.6
Power management	7	3.2	0.9
Battery	4.6	2.1	0.6
Mechanical/Electro-mechanical	35	16.2	4.7
Box contents	5	2.3	0.7
Manufacturing cost	4.5	2.1	0.6
Total manufacturing cost	215.6	100.0	28.8

Source: Calculations based on data from Macdailynews.com (2014)

As an assembler, it is not surprising that assembly manufacturing does not earn Foxconn much on a unit basis. The conclusion is that manufacturing does not automatically make the firm or country rich or bring value added. The practical result of Foxconn's position versus that of Apple's is simple. In 2016 Apple recorded $214 billion in revenues and $61 billion in pre-tax profits. For Foxconn, the same figures were; $136 billion in revenues and $4.9 billion in net profit.

For value creation, manufacturing activities require to be complemented with those other crucial value chain activities of invention, innovation, design, branding, and/or marketing. That earmarks a recent phenomenon that can be called *servicification of manufacturing*, signifying a convergence of manufacturing and service activities. The firms such as Apple achieving this convergence increase profitability and value generation.

Another example can facilitate the debate. By 2012, Turkey had a quite glorious automobile manufacturing sector, with some 1.3 million automobiles manufactured per year. However, the sector is characterized by manufacturing automobiles under the licences of global brands such as Ford, Renault, Fiat, and Toyota. The shareholding of the manufacturers themselves is mostly dominated by the same firms. The ultimate result was the direct economic impact of the automobile manufacturing sector (excluding spare part industry) on the total GDP of the country and was limited to less than 1% of the GDP.[16] A significant part of the profits of the foreign investor is repatriated abroad, reducing the value added left to the host economy.

As importantly, the sector (again excluding the spare parts exports) recorded significant net imports, although it was among the largest exporting sectors. This could be contrasted with South Korea, whose automobile manufacturing sector flourished through industrial policies. In the 1970s, South Korea prioritized local branding, indigenous technology, and establishment of Korea-centric value chains in the sector. Korean policies led to a significant generation of value add and net exports from the sector.[17]

Repeating the key takeaways from this section, not all industrialization and not all manufacturing add the same level of value to the GDP and economic development. The smile curve phenomenon is quite relevant to the assessment of the economic impact of industrialization; the value added is generated by the activities at the two ends of the smile curve. The two ends enable the manufacturing firm to produce differentiated rather than undifferentiated products (and assembly) and generate higher value added. Nevertheless, assembly can be useful as a first step to a future rise on the productive and technological learning curves, or up both ends of the smile curve. That requires policies at the firm and government levels to make sure that the firm is not trapped as an eternal low-value manufacturer.

Product life cycle is another important concept. It shows evolution of the sales (market penetration) of a product (or an industry), consisting of several phases (Fig. 5.14):

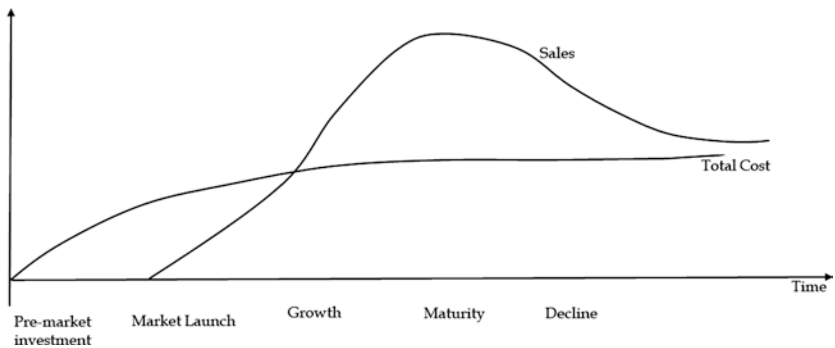


Fig. 5.14 Product life cycle

- Pre-production/pre-market investment phase. At this stage the firm starts incurring costs of physical (such as buildings, machinery, licences), human and institutional capital (such as management and quality systems, training) investments as well as R&D and product development costs.
- Market launch and production kick-off
- Growth of sales and production. The growth can be slow or fast, determining the steepness of the product life cycle curve. If no further development is necessary, the firm incurs only production and administrative costs during this phase.
- Maturation of sales
- Fall in sales as demand fades and/or alternative products and technologies emerge. This phase may end up with withdrawal from the market. Bar soap sales suffered but did not disappear after the entry of liquid soaps into the market (Fig. 5.15). However, mobile phones almost totally erased pagers from the market.

In parallel with rapid technological progress, an important phenomenon became more and more visible recently: shortening product life cycles. Prior to the nineteenth century product life cycles lasted hundreds (tobacco) or even thousands of years (wheel). Now product life cycles can be as short as a few years or less. A good example is the pager. The pager was invented in 1949 by Al Gross. Commercially viable launching could be made only in 1974 by Motorola. By 1980 the pager users reached 3.2 million in the USA. The number of users soared to 22 million in 1990 and 61 million in 1994. In the second half of the 1990s however, with the advent of cellular phones, pagers started to diminish and by the 2000s

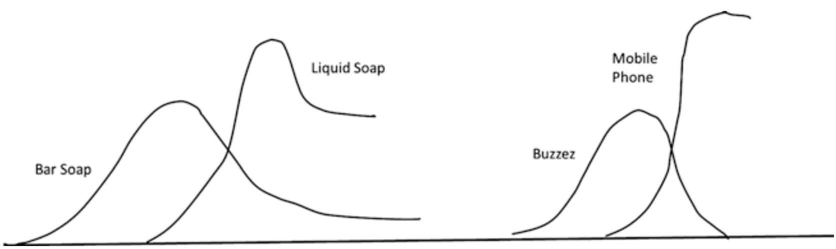


Fig. 5.15 Alternative cases of product life cycle

they virtually disappeared from the market.[18] The shortening of product life cycles is also reflected on firm life cycles, as demonstrated by Kodak's withdrawal from the market or Nokia's difficulties in shifting to Android.

The subcontractor which suffers from being at the bottom of the smile curve benefits from not incurring the value-added costs at the upper-left portion. By evading the development costs, it saves a significant chunk of the pre-market investment expenditures. However, once the product declines, its original physical investment costs necessitate the subcontractor to shift to the production of another standard product for the same or another principal. The same applies to the manufacturer of any undifferentiated industrial product.

Notes

1. The table does not include very small countries such as Monaco, Lichtenstein, Iceland, and Nauru and highly resource-based countries such as Qatar, which show high per capita manufacturing output due to the existence of few number of dominating manufacturing industries such as oil refining.
2. This section draws largely on Yülek (2017).
3. Thirlwall (1983).
4. Arisoy (2013), Atesoglu (1993), Bautista (2003), Bairam (1991), Bernat (1996), Felipe (1998), Guo et al. (2012), Fingleton and McCombie (1998), Hansen and Zhang (1996), Harris and Lau (1998), Leon-Ledesma (2000), Metcalfe and Hall (1983), Necmi (1999), Pons-Novell and Viladecans-Marsal (1999), Rayment (1981), Szirmai et al. (2013), Szirmai (2012), Thirlwall (2015), Celebi and Ozdeser (2016), Andreosso-O'Callaghan, B., & Lenihan, H. (2011), Paci & Pigliaru (1999), Beheshti & Sadighnia (2006), Drakopoulos & Theodossiou (1991), Vaciago (1975), Szirmai, A. (2013).
5. In the services, productivity growth remains relatively low; unless robots do the restaurant serving or haircuts, employment in services and thus wages do not fall, while in manufacturing rising productivity means less worker hours are necessary to increase the output, let alone keeping the production level unchanged.
6. See, for example, Pons-Novell and Viladecans-Marsal (1999).
7. Inomata (2013).
8. Manufacturing Institute (undated).
9. UNDP (2014).
10. Malthus (1798: vii).
11. British Fashion Council (2010); Yülek et al. (2015).

12. See, for example, Guo et al. (2013).
13. See, for example, Shin et al. (2012).
14. Macdailynews (2014).
15. Elmer-DeWitt (2013).
16. Yülek et al. (2015).
17. Yülek et al. (2015).
18. Bellis (2017).

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CHAPTER 6

Global Imbalances: Export-Led Growth Versus Import-Led Slowdown

When I attended international meetings as Fed chairman, delegates discussed at length the issue of "global imbalances"—the fact that some countries had large trade surpluses (exports much greater than imports) and others (the United States in particular) had large trade deficits. … The fact that Germany is selling so much more than it is buying redirects demand from its neighbours (as well as from other countries around the world), reducing output and employment outside Germany at a time at which monetary policy in many countries is reaching its limits.
(Ben Bernanke, former US Federal Reserve Chair[1]*)*

In the previous chapter, the relationships between world trade and manufactures were reviewed briefly. This chapter widens the discussion of why manufacturing is important from the angle of world trade. It explains why imports are associated with lower economic growth, and exports with higher.

International trade drives growth in incomes and production. However, benefits of trade are not equal for the parties on the two sides in the transaction. While total exports in the world equal total world imports by definition (statistical discrepancies prevent the accounting equilibrium between the two), there are countries which run trade surpluses (exports higher than imports in value) and those that suffer from trade deficits (imports higher than exports in value) over long periods of time.

M. A. Yülek, *How Nations Succeed*,
https://doi.org/10.1007/978-981-13-0568-9_6

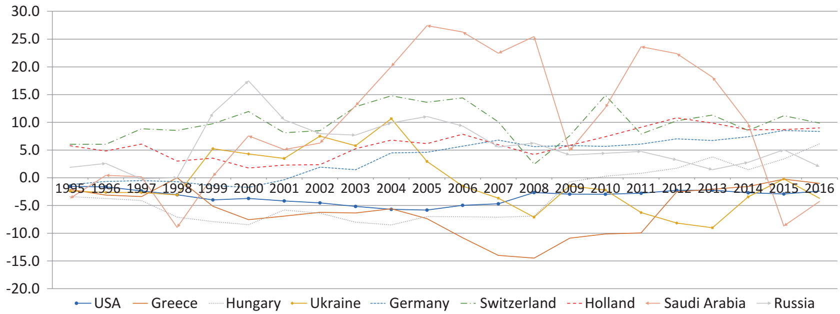

Fig. 6.1 Global imbalances prior to the global financial crises: current account balance of selected countries (% of GDP). (Source: IMF [WEO])

Prior to the global financial crises, that phenomenon was referred to as the 'global imbalances' (Fig. 6.1). It meant that some countries—such as China, Germany, Holland—ran high current account surpluses,[2] while others ran large deficits for long periods of time. The USA was (and is still) at the top of the deficit list.

On the surplus side, exports cause foreign currency to flow into the exporting countries from the deficit countries. This enables them to finance their imports, which are competitively produced in other countries, in addition to building international reserves instead of becoming indebted. Thus, they can reap welfare gains from trade in a sustainable manner.

In the wake of the global financial crises, two sets of countries ran the dominant part of the global trade and current account surpluses: the resource-based economies (such as Saudi Arabia and Russia) and the manufacturing giants such as Germany, Switzerland, and Holland (which is also a major agricultural exporter). The rest of the countries were simply the deficit countries whose exports could not match their imports. Their imports consisted of not only agricultural and energy products, which were essential for their existence, but more importantly, manufactured goods. Some of them were large importers such as the USA, which consumed a lot, and others were smaller economies such as Hungary or Greece. Countries like Germany or Switzerland, which ran trade surpluses, were also among large importers, as their export earnings allowed them to do so. They imported because they needed raw, intermediate, final, and consumption goods for their households and businesses.

Table 6.1 Current account deficits of selected countries before they were hit by the global crises

Country	*Current account deficit (2008)*	
	% of GDP	*Value ($ billion)*
Greece	14.4	51.2
Hungary	7.0	11.2
Ukraine	6.8	12.8
Italy	2.9	68.8
UK	3.6	101.2
USA	4.7	690.8
Iceland	22.8	4.0
Ireland	−5.7	15.7

Source: IMF (WEO)

Protracted imbalances in trade deficits and surpluses should be a standing concern. It is nowadays appreciated that continuing trade deficits lead to increasing international indebtedness of a country. Global imbalances are not sustainable for the world in the long run. They jeopardize 'international positions' and macroeconomic sustainability of the deficit countries. The countries which were hit most hard during the global financial crises were the ones with relatively high current account deficits (Table 6.1).

Countries need to participate in international trade on a fair and sustainable basis. At an extreme, as discussed in the first part of the book, persistent trade deficits or not being able to take an adequate share from international trade may force countries to find other—more aggressive—ways as Portugal did.

6.1 Trade and Macroeconomics

The course of a country's trade (and current account) balance is critical for the sustainability of the country's macroeconomics, as it involves outflow of resources. Protracted periods of trade deficits lead to unsustainable *external positions*, as they cause over-indebtedness of the nation (to put in a different way, worsening of its 'net international investment position') and make the country economically fragile. The fact that many of the economies that collapsed during the global financial crises such as Greece, Hungary, or Ukraine ran high deficits is illustrative of this.[3]

More importantly, higher imports (and growing trade deficits) may mean less growth and higher unemployment for the importing country.

I am sure you are alerted at this point; a country has to import if it is dependent on energy to run factories and houses, or on food products to feed its population. Also, clearly autarky (closing the economy to imports) is not optimal; it is not a wise policy for a country to try to produce everything at home. In order to improve welfare, it can specialize in certain goods and/or may successfully be a part of global value chains in different sectors.

More precisely, the first sentence in the previous paragraph ("higher imports and growing trade deficits may mean less growth and higher unemployment for the importing country") should be qualified as: *more 'unnecessary' imports mean less growth and employment*. 'Unnecessary' means either goods needed in the importing country which could have been competitively produced domestically (and are not actually produced due to some market failure) or goods for which the importing country has paid overdue prices.

International trade consists of merchandise (physical goods) and services. Merchandise represents the majority of international trade, about 80% of the total. Of the merchandise, on the other hand, 70% consisted of manufactured goods in 2015 according to the World Trade Organization (WTO) statistics. That excludes the exports of arms armaments, which are also manufactured goods.[4]

Evidently, trade balance is directly linked to the manufacturing sector in both developed and developing economies. Many developed countries run trade surpluses using the manufacturing sector, the German model. In developing countries it is the other way round; their trade deficits (caused by their dependence on vital food and energy imports) are worsened by the imports of manufactured goods such as automobiles and other transport equipment, machinery, and communications and IT equipment, and even industrial goods such as furniture or glass. This leads to positive growth and employment effects from manufacturing exports in developed economies and negative ones in the importing developing countries.

On these lines, this chapter discusses the link between trade balance on the one side and growth and unemployment deficiencies on the other. As manufactured goods are a significant driver of trade balance this link is actually between the manufacturing sector and economic growth.

6.2 Germany and Its Export-Led Growth

Let's first briefly look at the case of Germany, a successful exporter of manufactured goods. Germany is a manufacturing powerhouse in production and exports. Germany's merchandise exports reached $1329 billion in 2015 according to WTO. That is equivalent to a stunning 39% of its GDP; by far a world record among any major world economy. Germany is the third largest exporter in the world after China and the USA. Although its population represents less than 1% of the world population, its exports constitute 8.1% of the total world exports. And over 95% of German exports comprise manufactured products.

Meanwhile, domestic savings of the country have increased, leaving domestic consumption (households and government) flat or downward trending in relation to income. Consequently, imports have basically remained flat with respect to the GDP. This was despite the fact that the country needs imported inputs for its firms and households—at least imported energy to conduct domestic production in an international environment where energy prices went up. As a result, trade and current account surplus remained very high over the years, surpassing 8% of its GDP in 2015. That is a staggering world record over all major economics and all times except for China during 2006–2008.[5]

Germany's world record went into the popular media in an illustrative way:

> [Germany] doesn't want to "sacrifice" *its* trade balance just for the sake of Spain or Italy. See, Germany has turned itself into an export machine in the past decade by holding worker wages down. That lets it sell things abroad for less. But it hasn't bought more from the rest of the world even as it's sold more to the rest of the world—it's saved more instead. In other words, it's run up a prodigious trade surplus. It's a strategy that's worked well for German GDP, though not for German workers. And a strategy that can't work for everyone at once. There have to be buyers to match sellers. The euro's problem, as the U.S. Treasury points out, is Germany wants the rest of Europe to become sellers too, *but isn't willing to buy more itself.*
>
> Germany, of course, called this criticism "incomprehensible." Its Economics Ministry thinks that its massive trade surplus just shows the "strong competitiveness of the German economy and the international demand for quality products from Germany." But that's a non-sequitur. Germany doesn't have such a big trade surplus because it sells so many quality products. It has such a big trade surplus because it sells so many quality products *and* it buys so little. Nobody is asking Germany to stop making quality products. They're asking Germany to start paying their workers more and to start buying more from abroad.[6]

Germany's increasing trade surplus has supported its growth performance when its own population continued to save rather than consume. That earned Germany the name "growth engine of Europe,"[7] as current

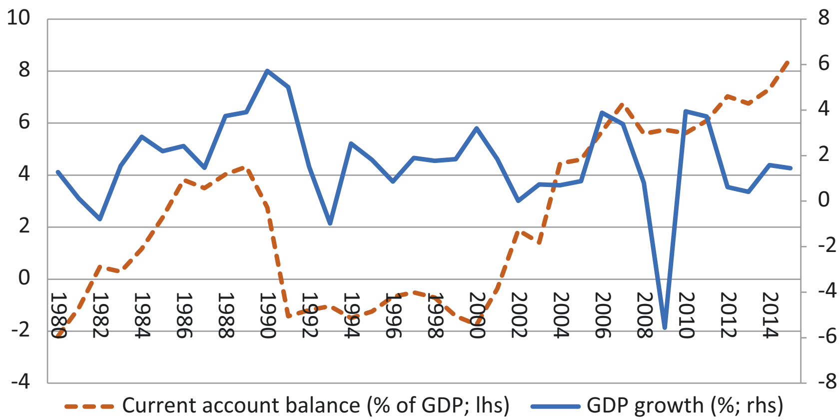

Fig. 6.2 Germany: GDP growth and current account surplus

account surplus and its GDP growth went in tandem (Fig. 6.2). After 2011, current account surplus went further up but economic growth stagnated. What happened was that the German population and government have increased their (national) savings (Fig. 6.3) and thus consumption fell. That meant a fall in overall demand for the German production that the increase in exports could not compensate.

Thus, the German case is a good example of an economy driving its growth through exports rather than through domestic consumption. The country—both the households and the government—saves a lot. The domestic manufacturing firms thus sustain themselves to a large extent by export businesses.

6.3 Why Do Imports Lead to Economic Slowdown and Unemployment: A Simple Explanation by the Macroeconomic Identities

The German case is illustrative of the positive link between exports and growth in the real world. The consequent key question relating to the trade balance that we will discuss in the remainder of this chapter is the theoretical story of the opposite: What happens to economic growth when one country runs a deficit in its international trade (when it imports more

Fig. 6.3 Germany: national savings

than it exports)? Does trade deficit, and imports, has a bearing on a country's economic growth? If so, why? How does that happen analytically and intuitively?

No new and major invention is necessary to answer these questions. And the answer is an intuitive one. Yes, trade balance has a direct and negative relationship with the growth of an economy: imports of goods that can be produced by an economy ('unnecessary' imports) reduce the growth in the economy, other factors remaining constant. At the same time, it also reduces the employment in the economy.

To show this let's use a simple macroeconomic framework. We start from the simple market equilibrium of supply and demand for goods and services in a country which is open to international trade at the end of a year. That is, at the end of the year, whatever, in total, was demanded in the domestic market must have been supplied.

In the equilibrium, the supply of goods and services equal each other in an economy. Goods are supplied either through imports (M) or domestic production (Υ). Demand, on the other hand, can come from domestic expenditures on goods and services (DA) or other countries' demand for domestically produced goods and services (exports of the country, X). Here, Υ actually represents the amount of total domestic production, within the territories of the country, of goods and services, and it is generally referred to as the GDP.

In mathematical terms, therefore, the equilibrium at the end of year t is represented by the identity:

$$M_t + Y_t = \mathrm{DA}_t + X_t$$

or

$$Y_t = -M_t + \mathrm{DA}_t + X_t \tag{6.1}$$

In 'difference' form, which shows annual changes in these variables, the same relationship can be expressed as:

$$\Delta Y_t = -\Delta M_t + \Delta \mathrm{DA}_t + \Delta X_t \tag{6.2}$$

In year t, economic growth in the GDP compared to the previous year is

$$\Delta Y_t = Y_t - Y_{t-1}$$

and the rate of growth is

$$g = \Delta Y_t / Y_{t-1} \tag{6.3}$$

Then (6.2) becomes

$$\Delta Y_{t-1} / Y_{t-1} = -\Delta M_t / Y_{t-1} + \left(\Delta \mathrm{DA}_t / Y_{t-1} + \Delta X_t / Y_{t-1}\right) \tag{6.4}$$

Combining (6.4) with (6.3) the arithmetic relationship between economic growth and imports become more apparent:

$$g = -\Delta M_t / Y_{t-1} + \left(\Delta \mathrm{DA}_t / Y_{t-1} + \Delta X_t / Y_{t-1}\right) \tag{6.5}$$

This is the basic relationship between economic growth on the one hand, and imports and exports on the other. For a moment, consider that the country's domestic consumption has not changed in year t so that $\Delta \mathrm{DA}_t = 0$ (maybe because the domestic consumers, government, and firms have not felt secure enough to spend more) and its exports also have not increased (maybe for a similar reason the rest of the world felt so) so that $\Delta X_t = 0$. Then, (6.5) would boil down to

$$g = -\Delta M_t / Y_{t-1} \quad \text{when } \Delta \mathrm{DA}_t = \Delta X_t = 0 \tag{6.6}$$

This basic result of the exercise shows the simple conclusion that overall imports are negatively related to economic growth in a country—other things being constant. For every 1% increase in imports in relation to last year's GDP, this year's GDP falls down by 1%.

Obviously, some of the imports are 'necessary' or even vital, as mentioned before. Depending on the country, necessary imports may comprise food and energy and also machinery and transport equipment to run factories. So, even if they also are macroeconomically 'growth-stealing' they need to be imported, as they provide vital benefits to the economy and society. But anything beyond that or wrongly priced imports both steal from growth and employment and do not bring additional benefits to the society.

Let's review the same simple relationship in simplified numerical terms using relationship (6.1), namely $\Upsilon_t = -M_t + D_t + X_t$. Table 6.2 shows three fictitious alternative macroeconomic scenarios. In both scenarios, domestic demand and exports of the country remain unchanged in year t. That leaves the domestic production to be affected only by the imports.

In the first alternative, the economy grows by 5% (in domestic currency in previous year's constant prices) only because the imports have declined by the same amount. This is demonstrative of the power of cutting unnecessary imports. In the third alternative, the same outcome is achieved by export growth. So, import substitution or export promotion cases gener-

Table 6.2 Imports and economic growth

	Υ	=	$-M_t$	$+D_t$	$+X_t$
Year t	100	=	−20	+95	+25
Year $t+1$					
Alternative 1 (5% GDP growth through reduction in imports)	105	=	−15	+95	+25
Alternative 2 (5% GDP contraction through increase in imports)	95	=	−25	+95	+25
Alternative 3 (5% GDP growth through increase in exports)	105	=	−20	+95	+30

Note: All in terms of an imaginary national currency in constant prices of year t

ated the same growth outcome, a 5% growth in the economy. In the second alternative, the economy contracts by 5% because imports have grown. Unnecessary imports cause economic contraction.

These simplified stories illustrate the mechanism of negative association of imports and growth.[8] Note that this negative relationship relates to an opportunity cost; had the unnecessary imports been less, the economy would have recorded a higher growth rate than actual.

Employment Effects of Imports

Why does employment fall in tandem with increasing imports, all other factors being constant? The answer is simple. In almost all economies today, employment comes from private businesses. They hire and fire according to the business conditions. If the sales increase, they tend to hire more workers with a lag, as the managers want to be sure that the increase in sales will be long-standing. If the sales go down the managers start to fire people, under regulations making firing difficult. In fact, the latter is a prime reason why in good days, managers need a lot of conviction to make hiring decisions, especially in countries where 'pro-labour regulations' making firing difficult at bad times are counter-productive.

Private businesses sell products either in domestic markets or in export markets. For countries such as Germany, South Korea, or China, foreign markets are as important as domestic ones as a source of sales opportunities. Especially, but not limited to these export-dependent economies, export markets are thus the driving source of employment and growth. In the importing country, the mirror image occurs; imports may lead to falling employment or may hinder employment increases compared to potential.

While the export-led growth is commonly recognizable or even exaggerated, in many cases import-led slowdown would go unnoticed by the population or policy makers. The former also fired the debates of de-industrialization or offshoring of businesses. In the 2016 presidential elections in the USA, these issues found a significant place in the election campaign of Donald Trump and continued to be important in his agenda after he became President.

To be precise, exports cannot be the prime determinant of the overall employment in any country. There are at least two reasons for that. Firstly, even in the strongest exporting countries, exports do not generally constitute more than 25% of the overall output. Secondly, the primary exports in many countries and that sector overall constitute a small part of overall employment, as we have seen the case of the USA. The reason, as alluded to before, is that manufacturing is not a large employer due to high productivity in the sector. Thus, exports, especially manufacturing exports, only partly explain the movements in employment. But they are nevertheless one of the major factors.

Notes

1. Bernanke (2015).
2. Current account basically refers to a country's trade balance, the difference between its exports and imports. Technically the income balance and net current transfers are also part of the current account balance. In many countries, their magnitude is generally small compared to the trade balance. Income balance refers to revenues of the country from returns on international financial assets (such as bonds) net of the opposite financial assets issued by the country held by non-residents of the country and remittances of employees working abroad net of expatriates working in the country.
3. Yülek and Yağmur (2015).
4. The remaining part of total manufactured exports is mostly accounted for by the primary goods (mainly food and agricultural products, ores, fuels) (WTO 2016: 76).
5. China's current account deficit was within 8–9% of GDP during 2006–2008 before drastically falling to 1.8% in 2011. Germany consistently ran very high current account surpluses after the year 2004. These surpluses are projected to continue at least in the medium run.
6. O'Brian (2013).
7. KfW (2015).
8. This conclusion obviously requires the aforementioned qualifications on the necessity of exports. For example, reduction in imports that are necessary for the conduct of domestic production (e.g. energy) naturally would lead to a reduction in domestic production rather than an increase.

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CHAPTER 7

Value Added and GDP: The Smart Versus the Donkey

If manufacturing matters, that is because it involves relatively higher value added compared to other economic activities. Value added is a very popular concept in daily political and economic talk. One hears it in the television debates and reads it in the newspaper articles. Everybody wants the level of value added in a product or country to go up. It is also a key concept inherent in the discussion in this entire book.

However, only a few are aware of what value added means technically and how it relates to manufacturing and GDP. This chapter discusses that and also relates the concept to industrial policy as a preparation for the next part of the book.

7.1 Value Added, GDP, Factor Accumulation, and Productivity

Technically, value added is a precise concept, although statistically it has its usual difficulties of estimation. It is important because the total value added generated by all actors that produce economic value in a country is equal to the GDP. The latter is defined as a statistical measure of the total amount of goods and services produced within the territory of a country. GDP is also equal to the total amount of income generated in a country. Per capita GDP or per capita income is widely used to compare the

M. A. Yülek, *How Nations Succeed*,
https://doi.org/10.1007/978-981-13-0568-9_7

developmental levels of countries; countries are divided into categories of low, middle, or high per capita income. Countries with higher per capita incomes are considered more developed than others.[1]

While quite imperfect in many respects, GDP and per capita GDP is considered the most widely accepted yardstick targeting design and assessment of policies. The quarterly or annual GDP (real) growth rates are considered a key performance indicator of economic policy across the globe. For example, if a country records negative growth rates for three quarters consecutively, it is technically defined to be in a recession. If a country at the middle-income level records slow growth during an extended period of time, it is said to be in the middle-income trap. In both cases, short- or long-term policies are sought to restore GDP growth.

As GDP is the sum of value added in the country, any policy that is related to it actually involves value added. Value added is simply the difference between the total sales of the firm (or the sector) and all the external costs paid to inputs. So, it is the value that the firm (sector) adds on the value of the inputs it receives (Fig. 7.1). Note that both are accounting values at market prices, not economic values (which would involve the so-called opportunity costs).

Value added calculated thus is equivalent to the sum of the firms' payments to its workers and to the capitalists (such as rents paid to office, factory, warehouse, or machinery; interest paid on borrowings; and after-tax profits).[2] This is quite intuitive; when the payments to external suppliers are deducted from the sales revenues, the rest should accrue to the 'factors of production' (labour and capital) of the firm (or the sector). In other words, the firm's value added is generated by the capital and labour under its disposal (Fig. 7.2).

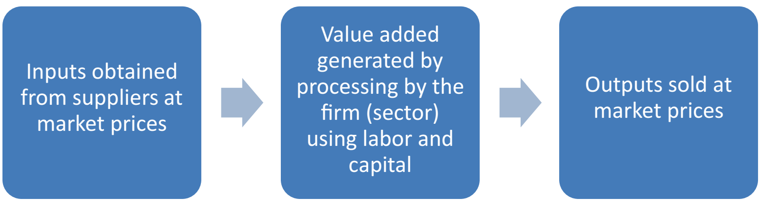

Fig. 7.1 The process of value add

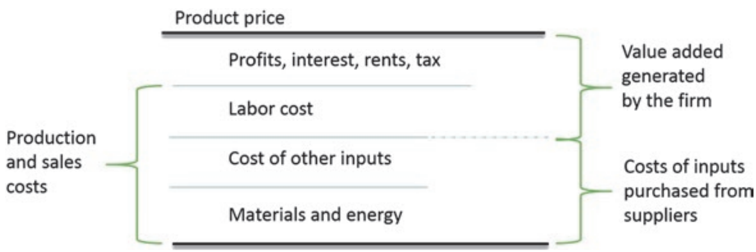

Fig. 7.2 Value added in a firm

Table 7.1 Value added in a simple economy[a]

	Farm Co	*Mill Co*	*Bakery Co*	*Total*
Sales	100	150	275	525
Purchases from suppliers	0	100	150	250
Value added	100	50	125	275
Labour payments	40	15	50	105
Profits	60	35	75	170

Note: [a]In fictitious monetary terms

Let's take a simple, well-known example to explain the relationship between value added and GDP. This will prepare the ground to answer the question of how value added can be increased. Imagine a simple economy with three firms. The first one, the Farm Co, produces wheat. The second one, the Mill Co, produces flour from the wheat purchased from Farm Co. The last one, the Bakery Co, produces bread from the flour purchased from Mill Co. For simplicity, assume all use green production facilities so that they do not purchase energy inputs. Moreover, assume for simplicity that the farmer does not need to purchase any inputs (fertilizer, seed, etc.).

Table 7.1 summarizes the economy which generates a total GDP (value added) of $275, while the firms' total sales are $525. The portion of GDP (income) that accrued to labour is $105 and to capital (in this case profits) is $170. Note that the GDP is also equal to the 'final sales' (sales to the households, in this case the sales of the Bakery Co).

Growth in GDP is simply the increase in total value added by all the production units in the country. The typical growth story is that growth of GDP can be achieved from either of two sources:

(A) Factor accumulation, which means higher utilization of production factors (physical investment in capital accumulation and increasing employment). That is, savings (either from the nation itself or borrowed from abroad) can be used to finance physical investment that deepens the capital stock of the country combined with the increased employment of the idle labour in the country.
(B) Increased overall productivity, which comes when the firms and government in the country learn to manage things better so that output can be increased even with the same level of capital stock and labour employment. This is called the *total factor productivity* (TFP).

Both alternatives lead to increased output per worker. Developed economies have exhausted the growth possibilities from factor accumulation, so the only major growth potential remaining to them is the second source, the TFP growth. That is why overall productivity gains are critical to them. The developing economies, on the other hand, have sources of growth open to them from factor accumulation as well as from productivity gains. They can invest in more factories and machinery and increase the employment of their idle labour force to produce more goods and services under the given level of population. That is why, in general, their growth rates are faster than developed economies. Based on this intuition, the so-called neoclassical economists believe that the economies are bound to converge on each other in terms of per capita GDP.

7.2 How to Increase the Value Added and the GDP: The Donkey Work Does Not Do the Work

In the example of the simple economy above, gains in TFP or factor accumulation can create growth if (i) more farm, mill, and bakery facilities are constructed with more labour employed (factor accumulation), or (ii) more products are generated from the same production facilities and labour (higher TFP).

Let's assume that the original level of GDP in the example in Chap. 6 (Table 6.2) is increased by 1% in real terms in response to more employment in the farm and bakery (Table 7.2). The increase in firms' (sectors) production levels reveals itself as increase in the firm's (sector's) generation of value added and is directly reflected in the GDP. So, increase in

Table 7.2 Value added in a simple economy[a]: factor accumulation and TFP growth

	Farm Co	*Mill Co*	*Bakery Co*	*Total*
Sales	102	152	278	532 (+7; +1.3%)
Purchases from suppliers	0	102	152	252
Value added	102	50	126	278 (+3; +1.0%)
Labour payments	41	15	51	107
Profits	61	35	75	171

Note: [a]In fictitious monetary terms

Fig. 7.3 Sources of growth: the simple story

production by the utilization of more factors of production is considered to be one of the two sources of economic growth along with factor accumulation (Fig. 7.3).

Before full employment and capital deepening are reached, factor accumulation and productivity increases will co-drive growth. However, when full employment and capital deepening are reached, productivity remains the only source of growth. That suggests that in the long run, every country is supposed to exhaust any possibility of remaining factor accumulation and the determining factor will be productivity. This is epitomized by Paul Krugman's (1997) simple but wise explanation:

> Productivity isn't everything, but in the long run it is almost everything. A country's ability to improve its standard of living over time depends almost entirely on its ability to raise its output per worker.

But is that really the end of the story? Is Professor Krugman right? Or, how much is he right? Is productivity increase the only recipe for economic growth? More importantly, is productivity increase the only way for poorer countries to catch up with richer ones; is it even adequate for catch up?

It turns out that the simple explanation of productivity being the driver of growth for poorer, less developed countries is not corned. Thus, productivity is not the panacea for catch-up for poorer countries.

To understand this, let's first look at how productivity is measured in practice, using Organization of Economic Cooperation and Development (OECD) (2006) discussion on productivity:

> Productivity is commonly defined as a ratio of a volume measure of output to a volume measure of inputs and measures how efficiently production inputs are being used in the economy to produce outputs. While there is no disagreement on this general notion, a look at the productivity literature and its various applications reveals that there is neither a unique purpose for, nor a single measure of productivity. There is also a general understanding that productivity matters for the standard of living and economic growth but to answer more specific analytical questions, different measures of productivity are required.
>
> In 2005, GDP per capita in the OECD area ranged from over \$35 000 in Iceland, Ireland, Luxembourg, Norway, Switzerland and the United States to less than \$15 000 in Mexico, Poland and Turkey. The differences in income reflect a combination of labour productivity (measured as GDP per hour worked) and labour utilisation, measured as hours worked per capita. A country's labour productivity level is typically the most significant factor in determining differences in income, particularly in countries with low levels of GDP per capita.
>
> The growth in GDP per capita can be broken down in to a part that is due to labour productivity growth and a part that is due to increased labour utilisation, measured as hours worked per capita. A slowing or declining rate of labour utilisation combined with high labour productivity growth can be indicative of a greater use of capital or of a dismissal (or failure to employ) of low-productivity workers.

In other words, GDP per capita can be expressed as (OECD 2006):

$$\begin{aligned}&\text{GDP per capita} = \text{GDP generated per hour worked in the country}\\&(\text{Labour productivity}) \times \text{Average number of hours worked in the country per person}\end{aligned}$$

In practice, productivity is measured by calculating a sector's or an economy's total value added (the latter one is the GDP) and dividing it by the estimated (or rather, assumed) total hours worked.[3] As the average hours worked do not change significantly over time, this arithmetical expression simply converts estimated GDP growth rate into hourly productivity.

The important question here is whether poorer countries can—in reality—close the per capita GDP gap with rich countries by recording faster productivity growth. The answer is no: in different countries, productivity (in terms of GDP dollars per hour in PPP terms) move quite close to each other. As Table 7.3 shows, various countries' productivity and productivity growth levels relative to Germany over the period of 1970–2000 remained quite stable except for South Korea. Why is South Korea different? We will discuss that key question in the next section.

The conclusion that can be drawn from Table 7.3 is that in the real world, most of the poorer countries could not catch up with the rich ones by achieving higher productivity since 1970. The gap in per hour GDP generation between richer and poorer countries seems impossible to close under the current trends. Taking an example, Table 7.4 shows that between 1970 and 2015, Portugal could close neither the productivity nor the per capita GDP gap with Germany. German per hour GDP generation was 1.8 times that of Portugal in 1970 and 1.9 in 2015. German GDP per capita (in real terms), on the other hand, was 1.8 times that of Portugal in 1970 and 1.6 times in 2015.

Table 7.3 The course of relative productivity in selected OECD countries relative to Germany (average GDP generated per hour relative to Germany; current prices in PPP US dollars)

	1970	*1975*	*1980*	*1985*	*1990*	*1995*	*2000*	*2005*	*2010*	*2015*
Germany/Turkey	1.9	1.9	2.1	1.9	1.7	1.9	2.4	2.2	1.8	1.7
Germany/Portugal	1.8	2.1	1.9	2.0	1.9	2.0	1.9	1.9	1.8	1.9
Germany/USA	0.7	0.8	0.9	0.9	0.9	1.0	0.9	0.9	0.9	1.0
Germany/Korea	7.0	6.5	5.9	4.6	3.5	3.0	2.4	2.2	1.9	2.1
Germany/Mexico	–	–	–	–	–	3.3	3.1	3.2	3.2	3.3
Germany/Holland	0.9	0.8	0.9	0.9	0.9	1.0	0.9	0.9	0.9	1.0
Germany/Japan	1.8	1.7	1.7	1.6	1.4	1.5	1.4	1.4	1.5	1.5
Germany/Switzerland	0.7	0.8	0.8	0.9	1.0	1.1	1.0	1.1	1.0	1.0
Germany/UK	1.2	1.3	1.3	1.2	1.3	1.3	1.2	1.2	1.2	1.3
Germany/Finland	1.4	1.4	1.4	1.3	1.3	1.2	1.1	1.2	1.1	1.2
Germany/Sweden	0.9	0.9	1.0	1.0	1.1	1.1	1.1	1.1	1.1	1.1
Germany/Spain	1.4	1.4	1.3	1.1	1.2	1.2	1.3	1.3	1.3	1.3
Germany/Russia	–	–	–	–	–	4.5	4.7	3.6	2.5	2.8

Source: OECD productivity statistics and author's calculations

Table 7.4 Productivity and GDP per capita: Germany and Portugal

	Germany (2015)	*Portugal (2015)*	*Germany/ Portugal (1970)*	*Germany/ Portugal (2015)*
Productivity: GDP generated per hour ($ PPP)[a]	66.6	36.0	1.8	1.9
GDP per capita ($ PPP)[b]	45,522	26,668	1.8	1.6

Notes: [a]Constant prices 2010 US dollar PPP. [b]Constant prices, 2010 US dollar PPP

Source: OECD productivity statistics

Table 7.5 High productivity, low value

	Country I	*Country II*
Population	100	100
Total number of hours worked per year	1000	1000
Number of backpacks produced per year	1200	1000
Labour productivity in real terms (backpacks per hour worked)	1.2	1.0
Average world price for the backpack produced ($)	1	10
GDP ($)	1200	10,000
GDP per hour worked (labour productivity)	1.2	10
GDP per capita	12	100

7.3 How to Increase the Value Added: The Smart Work

The traditional growth story ends at factor accumulation and TFP growth, whereas it should not; it simply fails to generate effective policy implications. The donkey is bound by natural limits to work harder and produce more.

Thus, Paul Krugman is right due to (A) in Sect. 7.1; but what about (B)? The difference in per capita incomes between richer and poorer countries does not emerge solely from productivity differences. In fact, a poorer country may enjoy higher physical productivity (and productivity growth) than a richer counterpart but still continue to be poor.

A simple example below demonstrates this for imaginary countries (Table 7.5). Imagine two countries, one rich and one poor with the same population. Only one (and the same) product is produced by each country: simple backpacks. So, not much technology is involved and they produce a product of the same quality. Both countries export the product and they import their needs with the proceeds. While it is the same product, the backpacks produced by the rich country are sold in the world markets, say, at ten times the price of the poor country's backpacks.

The poor country's physical productivity is much higher; it produces 20% more backpacks per labour hour than the rich country. Despite that, the per capita GDP of the rich country is about eight times that of the poor country because the rich country's selling price (of essentially the same product) is much higher.

The poor country wants to catch up with its rich peer in order to increase income and the wealth of its people. Asking the poor country to close the gap by increasing productivity (further) is not wrong, but it is an unsuitable policy; it will take decades for the poor country to close the gap by increasing its productivity ($1.2 per hour worked against 10), whereas its productivity is already higher than the rich country.

The upshot of the story is clear. It is not only the physical productivity that determines the income, as Paul Krugman suggests, and it is not the productivity that will determine the rate of catch-up. It is the world prices commanded by the product manufactured that creates the difference in GDP per capita.

What then should be the policy to be recommended?

In the 1980s, some economists led by Paul Romer offered a new solution to the problem: the endogenous growth theory. It suggests that countries may not converge economically naturally. If new knowledge is a by-product of the production (manufacturing) processes governed by the phenomenon of 'learning by doing' (LbD), economies may enjoy *increasing returns to scale*. As firms in these countries continue to manufacture, they continue to learn how to make better products at lower costs. That is, countries that have started industrialization earlier than others may keep up their growth rates.

Paul Romer's story also recalls policies on duty[4]; endogenous growth process emanating from positive externalities of production and physical and human capital investment would help developing countries to catch up with richer ones.[5] However, that requires industrial policies, as was the case in South Korea.

From the firms' perspective, the smart work means branding, 'technological protection,' or LbD. By empowering the firm to set its own prices, branding increases the firm's profits and thus the value added it contributes to the overall economy. This is because by branding its product the firm turns itself into a kind of monopolist. It now commands its own demand curve rather than sharing the big market demand curve of the undifferentiated product with other peers. The former is the case of the monopolistic competition, an idea developed by economists Edward Chamberlin and Joan Robinson. The latter, on the other hand, is the case of the competitive firm which does not have the power to set prices. The market for undifferentiated goods is the commodity market. If any of the suppliers raise their prices they will end up with no demand for their goods.

Brands compete with brands and share the total market. However, by setting their prices optimally, their profits and profitability are higher than the competitive firms. Technological protection gives the firm a similar power of monopoly. It can be through a formal (mainly patents) or informal arrangement (proprietary know-how and technology). This advantage comes mostly through formal R&D.

LbD allows the firm to reduce its unit costs by increasing cumulative production. That is the typical explanation, as will be taken up in a little more detail in Chap. 12. However, LbD also applies to technology management, especially in the continuous process of introducing new products and making money out of it. This is apparent in machinery, automobiles, and IT hardware and software industries, among others. Companies in these industries are continuous developers of new products before being their manufacturers. As mentioned before, some of them, such as Apple, do not even undertake physical manufacturing, which is at the bottom of the smile curve.

7.4 Industrial Policy: South Korea's Smart Work

The example in the previous section was intentionally simple; both countries produced the same product. However, the 'nation brand' of the richer country commanded a higher price. This definitely happens in the real world; try buying essentially the same bag made by a Chinese firm and a French firm. However, in the real world countries specialize in different products. As discussed before, poorer ones generally focus on primary goods or low-value-added manufactured goods. The richer countries, on the other hand, focus on the upper ends of the smile curve and benefit from brand names and technological leadership.

It is the appropriate industrial policy that changes the production structure of the economy. The products that the economy produces and their 'privileged' world prices are key. In the case of 'undifferentiated,' standard products, the producer cannot command prices; the client can shift to the competitor in response to a small increase in price. In the case of a 'differentiated' product however, the producer charges a 'privileged' or 'monopoly' price.

Privileged world prices are achieved by either technological factors or branding (including nation brands). This is how South Korea seems to have changed the course of its GDP per capita. In South Korea, GDP generated per hour worked was one-seventh of Germany in 1970, falling to one-half in 2015 (Table 7.6); it is the only country that was able to command this downward trend among the selected countries in Table 7.3.

This happened through an industrial policy that targeted sectors; the structure of Korea's economy has changed rapidly and drastically through industrial policies during the 1960s and 1970s from an agrarian one to an export-oriented industrial one. The share of agriculture, forestry, and fishery fell from almost half of the GDP in 1950s rapidly to less than 20% already at the end of the 1970s (Table 7.7). The share of manufacturing meanwhile increased from 12% to 30%, while that of services remained unchanged.

However, Korea's industrialization was not a mere transformation to the production of cheap and low-tech manufacturing products. Rather, it was a deliberate evolution towards higher-value-added, more sophisti-

Table 7.6 Productivity and GDP per capita: Germany and South Korea

	Germany (2015)	*South Korea (2015)*	*Germany/South Korea (1970)*	*Germany/South Korea (2015)*
Productivity: GDP generated per hour ($ PPP)[a]	66.6	31.9	7.0	2.1
GDP per capita ($ PPP)[b]	45,522	34,415	7.4	1.2

Note: [a]2010 constant prices US dollar PPP. [b]2010 constant prices, US dollar PPP
Source: OECD productivity statistics

cated manufactured products. Top exports continued to migrate towards higher value and technology products were up on both sides of the smile curve. In 1960 the top ten export products comprised almost entirely of raw and agricultural materials (Table 7.8).

Table 7.7 South Korea: change in the composition of GDP (1960–1980)

	Agriculture, forestry, fishery	*Manufacture, mining*	*Utilities, construction*	*Services*
1954–1956	44.6	12.0	3.2	40.2
1957–1961	39.1	15.0	4.2	41.5
1962–1966	40.0	18.1	4.4	37.5
1967–1971	28.0	21.8	6.3	43.9
1972–1976	24.5	26.7	5.8	43.0
1977–1981	18.3	30.0	9.2	42.6
1982–1986	13.5	30.2	10.9	45.4

Source: Kim (1981)

Table 7.8 The change in South Korea's production pattern: top ten exports over time

	1960	*1970*	*1980*	*1990*	*2000*
1	Iron ore	Textiles	Textiles	Electronics	Semiconductors
2	Tungsten ore	Plywood	Electronics	Textiles	Computers
3	Raw silk	Wigs	Iron and steel products	Footwear	Automobiles
4	Anthracite	Iron ore	Footwear	Iron and steel products	Petrochemical products
5	Cuttlefish	Electronics	Ships	Ships	Ships
6	Live fish	Fruits and vegetables	Synthetic fibres	Automobiles	Wireless telecommunication equipment
7	Natural graphite	Footwear	Metal products	Chemicals	Iron and steel products
8	Plywood	Tobacco	Plywood	General machines	Textile products
9	Rice	Iron and steel products	Fish	Plastic products	Textile fabrics
10	Bristles	Metal products	Electrical goods	Containers	Electronics home appliances

Source: Ahn (2013)

By 1970, they consisted almost entirely of unsophisticated, low-value manufactured goods. By 1980, they included heavy industrial goods such as iron and steel and ships as well as electronical and electrical goods. By 1990, electronics was the top export product, while automobiles and chemicals also appeared among the top exports. Top exports have not included any raw or agricultural materials. By 2000, semiconductors topped the list along with computers and automobiles. On the back of this transformation, by 2015, South Korea, representing less than 1% of the world population, became the fifth largest exporter in the world, accounting for 3% of world exports.

All this success of South Korea in changing its production and export pattern was not by accident. It was the result of deliberate industrial policies. Korea's automotive industry programmes, starting in the 1960s, and its nuclear power programme, which started in 1956, are good specific examples of this transformation. They will be discussed in more detail in Chap. 11.

Notes

1. It should be noted that there are growing criticisms as to whether per GDP is really a perfect measure of economic development. However, with detailed national accounts prepared by statistical agencies in every country, practically it is still the most widely used measure. Per capita income is also used as a headline measure of productivity in a country.
2. Technically adjustments have to made in the calculations to account for the taxes paid to the state.
3. In fact, this expression is in effect a tautology; productivity is calculated by dividing GDP (per capita) by average number of hours worked per worker.
4. Barro (1990).
5. Yülek (1997).

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PART III

Industrial Policy

CHAPTER 8

The Industrialization Process: A Streamlined Version

The Industrial Revolution is considered a watershed which subsequently gave birth to the knowledge revolution. In fact, the two are intertwined; the development of knowledge and the scientific revolution, in turn, have preceded the Industrial Revolution. This chapter first reviews the historical process that led to the Industrial Revolution and then describes a streamlined version of the industrialization process that applies today.

8.1 The Scientific Revolution and Its Precursors

It took a few centuries for the British and other European nations to absorb the scientific tradition from the Islamic precursors (Fig. 8.1). The famous universities in Europe of Bologna, Paris, Cambridge, and Oxford, among others, were founded starting at the end of the eleventh century, much before the Industrial Revolution. It is worthwhile noting that they were modelled after hundreds of earlier counterparts in the Islamic countries of the time such as in Tunis (Kairouan and Zaytouna), Morocco (Qarawiyyin), Spain (Cordoba), Iraq (Baghdad), Iran (Nishabur), Afghanistan (Herat, Belh, etc.), India, and Egypt (Cairo).

Hundreds of scientists in the medieval Muslim world, some of whom were non-Muslims, invented algebra, chemistry, and optics and developed physics and medical sciences. In the twelfth century Al Jazari of Anatolia, a renowned polymath and engineer, founded robotics, built

M. A. Yülek, *How Nations Succeed*,
https://doi.org/10.1007/978-981-13-0568-9_8

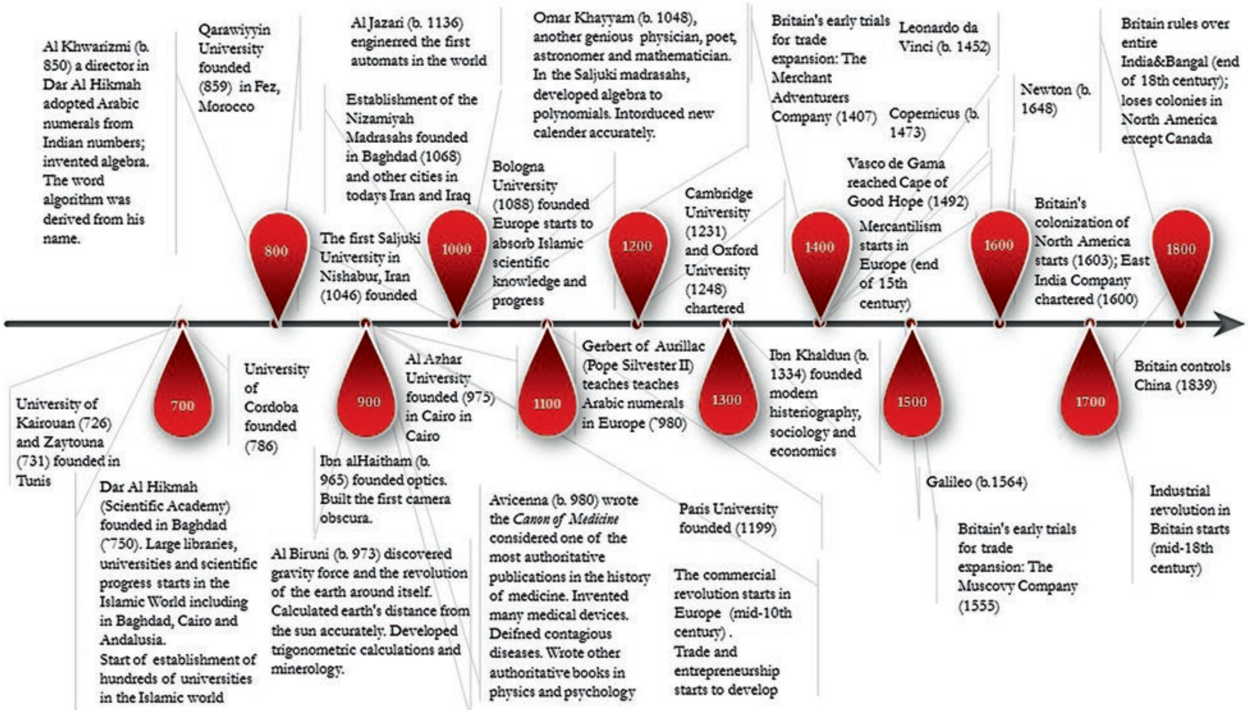

Fig. 8.1 Selected scientific precursors of the Industrial Revolution

many water-driven devices, and authored *The Book of Knowledge of Ingenious Mechanical Devices*. At the beginning of the eleventh century, Ammar Ibn Ali Al-Mosuli, an Iraqi ophthalmologist, invented a suction-based cataract removal procedure. In the ninth century, Muḥammad ibn Mūsā al-Hwārizmī, a Central Asian scientist, invented algebra (Al Jabr) in his book *Hisab al-Jabr wal-muqabala*. Polymaths Biruni and Hayyam developed algebra, polynomials, and trigonometry. In the tenth century, Abulcasis (Al-Zahrawi) invented many surgical devices, some of which are still in use, and the first surgical thread from cat intestines. His 30-volume book, *Kitab al Tasrif*, is considered a zenith of medical knowledge along with Avicenna's *Canon*.

The mathematical and scientific knowledge of the Islamic world was carried to Europe by the likes of Fibonacci—and of Gerbert of Aurillac, who studied in universities ("kulliyahs" or "madrasahs") in Cordoba and Sevilla before becoming Pope Silvester II in 999 AD. Roger Bacon, a Briton, carried the knowledge to Oxford; he was influenced by Averroism (Ibn Rush), which was dominant in Paris when Bacon studied there in the thirteenth century. Bacon was also influenced significantly by Avicenna's (Ibn Sina) work on medicine (the *Canon/Al Kanun fi'l-Tibb*) of the tenth century and Alhazen's (Ibn Haitham) well-known books on optics (*Kitāb al-Manāẓir*) and physics as well as his camera obscura of the eleventh century. On the other hand, Averroes' rejection of the Ptolemaic model paved the way for the Copernican model. Newton and Galileo Galilei were directly or indirectly influenced by the works of the Muslim scientists. The Crusades are also considered a major conduit for the flow of Eastern knowledge to Europe.[1]

It is reasonable to assume that the European scientific revolution started in the seventeenth century with Newton mathematizing physics in his *Philospohiæ Naturalis Principia Mathematica* (1687). And once grasped, the new science led to technological development and the Industrial Revolution. However, scientific progress appeared to be a necessary but not sufficient condition for technological and industrial development. Knowledge is generated not only in academia but also on the shop-floor and in the inventor's garage. The UK started industrializing in the eighteenth century with textiles and steel production. Nowadays, countries like Cambodia are starting to industrialize which the clothing industry. China, India, Pakistan, Malaysia, and South Africa produce significant industrial products. So, do South Korea, Switzerland, and the USA. Using per capita manufacturing value added, Lichtenstein, Puerto Rico, Nauru, and San Marino are among the most industrialized countries in the world.

8.2 Industrialization

So, what is industrialization? What does a typical, streamlined industrialization process look like? How can we distinguish less and more industrialized countries from each other by looking at what stage of industrialization a country is in? How much economic value can a country derive from different stages of industrialization? This section looks at these questions.

Industrialization shows itself in terms of increasing the share of manufacturing in total GDP. In pre-industrialized countries, agriculture is generally the predominant economic activity. Depending on the country, services (for example trade) may also be a significant economic activity. As the country becomes industrialized, some of the labour is transferred to the manufacturing sector. As labour productivity in manufacturing is relatively higher, the share of manufacturing in total output increases both because more labour migrates from the traditional agricultural sector to the manufacturing sector and also because of the productivity differential between the traditional and the modern sectors.

Industrialization also shows itself in the form of more and more factories. In factories, industrial products are manufactured using industrial machinery and equipment. Can one, thus, consider a country which has a lot of factories or one which manufactures a lot of industrial products in factories to be 'industrialized'? Or rather 'fully industrialized'? How can one distinguish one industrialized country from another in terms of the actual level of industrial development or in terms of where in a full-fledged process of industrialization a country stands?

The previous part of the book shows that the increase in the share of manufacturing in the output (GDP) of a country does not last forever. In fact, it stalls and subsequently falls. In some cases, not only this share but also the absolute value of manufacturing production per annum may also fall in time. This happens as the country becomes a developed economy. Some interpret this as de-industrialization. But not all decreases in the share of manufacturing on total value added can be classified as de-industrialization. On the other hand, experience has shown that developing economies face the risk of premature de-industrialization.

The output of the manufacturing sector comprises consumption, intermediate, and capital goods. Capital goods (which consist of machinery and equipment—henceforth, both categories are referred to as machinery) are used to convert raw and intermediate inputs into end-products. Consequently, along with labour, capital goods represent a significant input for other manufacturing activities as well as for services. So, the machinery is a critical component of industrialization. On the other hand, shop-floor learning, R&D, and innovation constitute important factors that make manufacturing possible and help it progress.

The Evolution of Industrialization: From 'First' to the 'Fourth' Industrial Revolution

There are varying interpretations of the stages of the industrial revolutions. A popular, time-bound one goes as follows.

The first industrial revolution started in the second half of the eighteenth century in the textile industry. With new inventions in textile manufacturing, cotton mills replaced spinning and weaving in small cottages. Water and steam power were the main energy source during the first industrial revolution. The invention of the first mechanical textile loom (the 'power loom') by Edmund Cartwright in 1784 is generally taken as the most important development in the first industrial revolution. Cartwright's loom facilitated the powering of the textile mills by water rather than by people. It was not successful initially; in the previous two centuries others had thought of and designed similar looms but they were not patented or actually built.

Prior to the first industrial revolution, international trade was largely limited to the end-products. The international trade of capital goods (machinery and equipment) was quite limited, while regional trade of them existed; various nations had the capacity to manufacture capital goods of the time in certain degrees. For example, textile machinery such as the spinning wheel or hand loom was manufactured locally in many countries. When India used to be the world's top cotton fabric producer and exporter, Indian cotton fabrics were woven by the use of Indian-made hand looms. African thread spinners used African spinning looms. European swordsmiths used European, Syrian swordsmiths used Syrian, and Japanese swordsmiths used Japanese anvils and hammers.

The second industrial revolution came at the end of the nineteenth century with the introduction of mass production through assembly lines. The monorail line on which animal carcasses were carried forward to facilitate meatpacking in a Cincinnati slaughterhouse in the 1870s is generally considered to be the first modern production line. In 1913, Henry Ford famously developed his assembly line for the *Model T* on the Cincinnati example.

Before the first industrial revolution, manufacturing activities were undertaken in small workshops by artisans often organized into guilds, which also promoted ethics and morality through religion as well as a collective voice for the trade. These started their career as apprentices and subsequently were promoted to journeymen. The journeymen then became masters, who had the right to open a new workshop. The Industrial Revolution gave way to factories and erased the older forms of manufacturing. With the first and second industrial revolutions, the division of labour intensified, though secular unions were established, largely focusing on workers' material rights and benefits and not spiritual matters. Production scales and productivity of labour increased, driving up the average income in the country.

The third industrial revolution is considered to be the result of the introduction of electronic and information technologies to automate and control manufacturing processes, especially in automobile production. It is referred to in the introduction of the first programmable logic control (PLC) equipment (Modicon 084) in 1968 by an American company, Bedford Associates.

Nowadays, some argue that digitalization has led to the start of the 'fourth industrial revolution,' in which manufacturing activities and information technologies converge on each other. Under its *2020 Hi-Tech Strategy*, the German government has developed the concept of *Industrie 4.0*. According to Professor Henning Kagermann, the President of the National Academy of Science and Engineering of Germany:

> Industry 4.0 is the German strategic initiative to take up a pioneering role in industrial IT which is currently revolutionizing the manufacturing engineering sector. Industrie 4.0's strategy will allow Germany to stay a globally competitive high-wage economy. … Germany has the potential to develop its position as a leading supplier and to become the leading market for Industrie 4.0 solutions—thereby strengthening the German economy, intensifying international cooperation and creating new, internet-based markets.[2]

8.3 A Streamlined Process of Industrialization[3]

Notwithstanding a time-bound categorization of the stages of industrial development in the world since the first industrial revolution, in this section we will define a typical process that has repeated itself over time in different countries. This streamlined version of the industrialization process can be considered to consist of four consecutive stages, as presented in Fig. 8.2.

At the outset of the first industrial revolution, the first industrial machinery was manufactured in the UK and other early industrializing

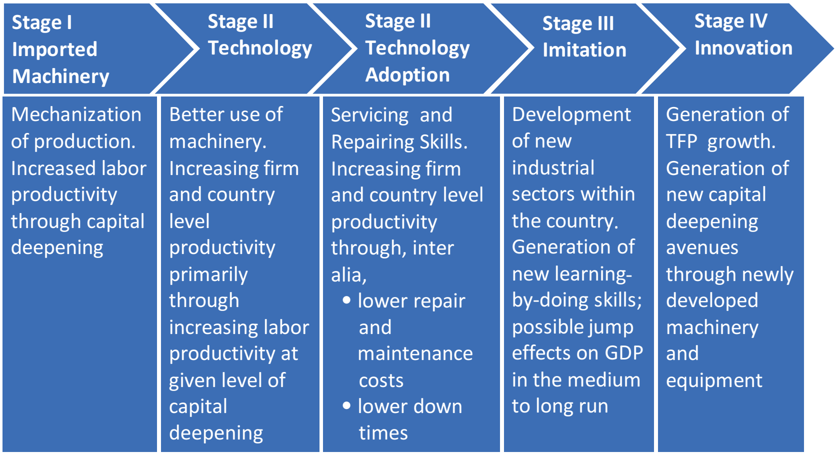

Fig. 8.2 Stages of industrialization

countries. In the process—whether they were aware of how Colbert transferred glass technology from Venice and textile technology from Flanders or Edward III's policies in England—the administrators in the UK were careful in preventing technology transfer to other countries. Skilled masters of textile machinery were not allowed to leave the country.[4] As the Industrial Revolution progressed however, countries which had not manufactured industrial machinery, ranging from locomotives to machine presses or weaving machines, had the opportunity and necessity to import them from those who manufactured them. The industrialized country benefited from exporting technology-embedded machinery.

Machinery possesses embedded technology, which is a product of 'technological knowledge' accumulated incrementally over years of physical R&D, including shop-floor learning by doing (SFL), which is generally acknowledged as LbD in manufacturing plants. Technology can be usefully defined as the relationship of conversion of inputs to outputs.[5] When a firm or country imports foreign machinery in order to increase labour productivity, it actually imports the technology embedded within the machinery developed by the exporter. Importing machinery is an act of 'capital deepening' and leads to an initial jump in the (per hour) productivity of domestic labour (Stage I in Fig. 8.2), as it changes the production technology; it is a general observation that countries with low capital accumulation record high GDP growth rates when capital deepening occurs. However, it takes time for the full benefits of the new machinery to be reaped, as it takes time for labour to use machinery more effectively.

Over time, the importing country, through its firms and labour force, develops skills to run the machinery more efficiently. This is referred to as the 'adoption' of technology (Stage II). Adoption of new technologies can be defined as the use (i.e. not the development) of new and more efficient mappings between quantities of inputs and outputs.[6] Better training of the workforce is considered to increase the speed of adoption of the technology embedded in the machinery. That in turn can lead to further gains in productivity in the firm and the country at a given level of capital stock. This adds to the productivity benefits acquired during the first stage, capital deepening.

A good user of machinery, and thus the embedded technology, is not necessarily also good in servicing or repairing the machinery. Acquiring these skills is a further stage in development and such skills would increase the overall productivity gains from the imported machinery by, for example, reducing downtimes or maintenance/repair costs (Stage III). That further complements the productivity benefits from the initial capital deepening. At the same time, it reduces the dependence of the importing country on after-sales services.

South Korea's *nuclear power programme* is a good example of the achievement of Stage III. Sung and Hong (1999) define Korea's nuclear power programme, which started in 1956, as an "imitative catching-up process," with a view to develop "the absorptive capacity of foreign technology". In 1956, South Korea was a low-income country with low levels of exports, which were made up of primary products; by the 1990s, it had completely localized the nuclear power generation technology and turned it into an export item.[7] This made South Korea one of the very few countries in the world with nuclear generation technology.

The next possible stage in the industrialization process is 'imitation' (Stage IV in Chart 1). If this stage is ever reached by a country, firms reverse-engineer some of the imported machinery or products and build similar or slightly different ones. This is a new sector for the country. For example, starting with firms producing textiles, now the country has firms manufacturing textile machinery. Countries including the USA, South Korea, Japan, and Russia have experienced this stage at different times.

Imitation may unleash a new growth engine for the firm and the country through possible import substitution effects as well as through new skills generation and learning. This is because significant learning spillovers are at play at this stage, as knowledge, including manufacturing know-how, is a public good. Imitation by reverse engineering (by persons formally trained or trained by SFL) is a shortcut to answering some of the questions the firm does not have the means to answer otherwise under the lack of formal R&D activities and budgets.

There is a limited but valuable amount of new learning potential at this stage; the contribution of imitation to technological knowledge is limited and it does not add to global technological knowledge. However, for developing countries, imitation can be a shortcut to the 'catch-up' process. It may however not ensure complete catch-up, as reverse engineering makes it possible to uncover only a limited part of the embedded technological knowledge (and thus the returns to the 'imitation' investment) of the machinery.

The next and ultimate step in the industrialization process is developing new products (Stage V). This can be either through formal or informal R&D or through incremental innovation. Both unleash TFP-based GDP growth. They might also lead to new capital deepening and productivity-enhancing avenues thanks to the newly developed products and machinery. This stage requires properly skilled human resources, such as R&D engineers. Countries which have reached this stage have firms at the boundaries of commercialized products. In order to compete globally, they need to develop new products, which is costly but at the same time which provides them with a certain period of pricing power.

Where Is Your Country Located in the Industrialization Process?

Locating countries on the process map is a rather subjective exercise. Perhaps a scoring tool could be developed for this purpose, but even that may yield controversial results. A country may be in Stage IV in actuality, whereas it may be qualified in Stage III by the analyst.

Moreover, some countries may be in more than one stage. There are two reasons for this. Firstly, the allocation of a country to a stage may need to be done on the basis of the 'center of gravity' of its manufacturing industry. A country's industrial standing can be different for different manufacturing sectors. For example, South Korea can be considered a Stage II country in aviation equipment, a Stage III country in synthetic textiles and a Stage IV country in electronics. Secondly, it may be simply not possible to assign a specific stage to a country's 'centre of gravity' in the manufacturing sector before a detailed sectoral analysis is completed.

Table 8.1 Classification of countries in terms of industrialization

Stages of industrialization	*Stage I*	*Stage II*	*Stage III*	*Stage IV*
Features	Putting imported machinery into use (capital deepening); this leads to an initial jump in the (per hour) productivity of domestic labour	Adoption of technology; the importing country, through its firms and labour force, develops skills to run the machinery more efficiently. The machinery can be repaired and serviced by local manpower. Labour productivity continues to rise	Imitation of sophisticated industrial products of other countries; locally branded industrial goods	Development of new and sophisticated industrial products
Product examples	Textiles and garments, plastics	Textiles and garments, plastics, automobiles or aircraft under licence, assembly of electrical and non-electrical equipment, assembly of electronical equipment	Technical textiles, locally branded automobiles or aircraft; flat screen for TVs, smart phone equipment, electronical equipment	Branded textile and garments, technical textiles, locally branded automobiles, new medical equipment, branded GSM equipment
Selected countries	Bangladesh	Turkey, Pakistan, Brazil, India, China, Malaysia, Iran	Korea, China Malaysia	Switzerland, USA, Germany, Japan, Korea China

Source: Yülek (2018)

Table 8.1 presents some tentative placements of selected countries on the industrialization process map. Taken as an example, Turkey is identified as a Stage II country. Looking at a major comparator, South Korea is identified as an either Stage III or Stage IV country. The reason for this selection for Turkey is that Turkey has so far industrialized primarily on the back of imported equipment. At the moment it is a country which manufactures goods by using this equipment. Its products are mostly standard, undifferentiated ones with medium-technology content. The country's exports mainly consist of industrial goods, but it has not ventured adequately into the imitation of higher-technology products or development of relatively more sophisticated products such as flat screens, smartphones, tomography equipment, or Computer Numerical Control (CNC) machines. Moreover, it has not been able to develop locally developed or branded automobiles, aircraft.[8]

On the other hand, Bangladesh is a Stage I country; some may argue that it is in between I and II. There is no doubt that Bangladesh is becoming industrializing on the back of capital deepening through foreign machinery. The predominant industry is textiles and garments. Whether it uses, repairs, and services the machinery locally with ease determines its passage to Stage II. Clearly, it is not a Stage III country.

This exercise can be undertaken more technically by analysing the industries in more detail, collecting relevant data and information. Ultimately, it will help fine-tune policies needed to take the country successfully to further stages. Rather than one-size-fits-all policies, the country should adopt focused policies appropriate to its industrialization stage.

Notes

1. Saliba (2007), Ragep (2007).
2. GTAI (undated: 3).
3. This section largely draws on Yülek (2017).
4. Freeman and Soete (1997), Chambers (1961).
5. Foster and Rosenzweig (2010).
6. Foster and Rosenzweig (2010)
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CHAPTER 9

The Industrial Layer

At the receiving end of the industrial policies is the 'industrial layer' composed of industrial entrepreneurs, firms, labour (both managers and workers), and finance. The quality and quantity of the industrial layer players are a critical success factor for the industrial policy no matter how 'well' it is designed and implemented. Other than some abstract consideration contemporary economic literature does not say much about the nature of the industrial production and investment process, its internal and external actors, and the interaction between these actors. The manufacturing activity in economic theory is thus represented by a production function of some simple mathematical form. The industrial firm is considered as a simple, neutral agent. This implies that the industrialization process proceeds along some simple physical investment model.

The reality is much more complex, and that is why many countries have failed to industrialize and fall into the middle-income trap. Industrialization process is primarily undertaken by industrial firms. Primary and direct agents of industrialization, they are established and led by *industrial entrepreneurs*. Industrial firms hire workers and managers, seek capital, select manufacturing technologies, build factories, develop and manufacture industrial products, and sell them in domestic and international markets.

In the process, the industrial firm acts as part of a national ecosystem which may be called the 'industrial layer' (Fig. 9.1). It consists of the industrial entrepreneurs, industrial labour, and industrial finance in addition

M. A. Yülek, *How Nations Succeed*,
https://doi.org/10.1007/978-981-13-0568-9_9

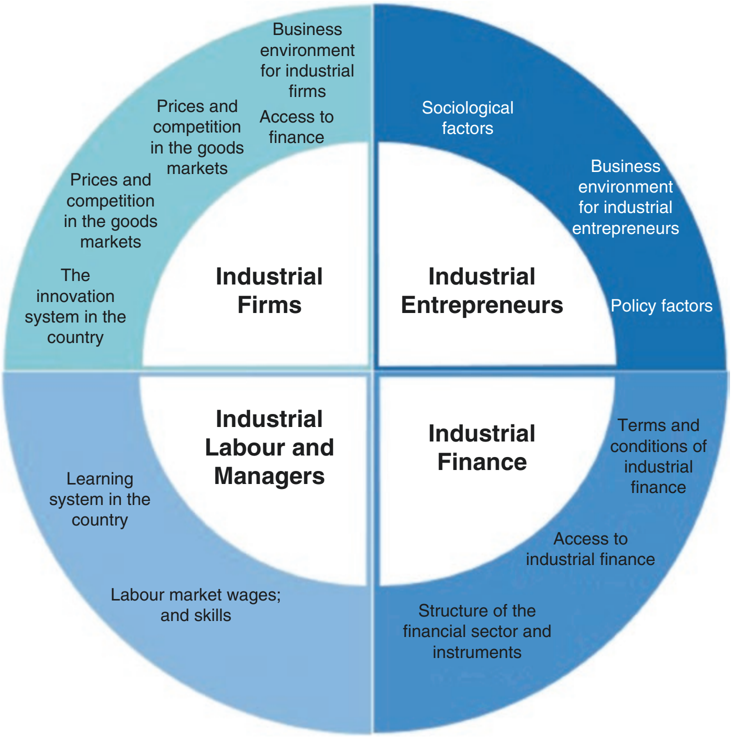

Fig. 9.1 The industrial layer

to industrial firms. It is important to note that the industrial layer is a concept wider than the (regional or local) industrial ecosystem. Typically, an industrial ecosystem, or a cluster, is considered to comprise closely linked networks of supplier firms. Production plants without a cluster bear higher costs of production and logistics, jeopardizing the initial investment decision. That explains the efforts in many countries nowadays to form industrial clusters to encourage industrial investments. Earlier, the clusters used to form around a pioneering plant (mostly state owned) which had to bear heavy set-up costs. As a case in point, in the early Turkish experience, industrial clusters in different towns emerged by themselves around textile factories built by Sümerbank (a state-owned bank and textile conglomerate) between the 1930s and the 1970s.

Nevertheless, it is easier to build an industrial cluster than the entire industrial layer. As certain features of the industrial sector (the collection of the industrial firms) are very different from the sectors in the primary and tertiary sectors, the industrial layer carries some peculiarities as well. Industrialization is made possible by the inflow of skilled and unskilled labour and capital from other sectors through the initiatives of the industrial entrepreneur; that is, industrialization is made possible by the entire industrial layer. Working conditions and returns (wages for labour, profits, rents, and interest for capital) on a comparative basis, along with the labour's skill level, determine the rate of transfer of the factors of production flowing into the industrial sector.

For different reasons, labour or capital may be reluctant to flow to the industrial sector. In Turkey, for example, unskilled workers are known to prefer service sector jobs (the most popular being guard positions in shopping malls) to manufacturing, as the former is considered to have better working conditions. Likewise, entrepreneurs tend to concentrate on real estate or service sector investments instead of the industrial sector, which is perceived as riskier. In many countries, the commercial banking sector can allocate a small portion of its resources to industrial lending and, generally, such lending carries short maturities and high interest rates. Such tendencies are likely to lead to inefficient outcomes for the economy.

The scope of industrial policies, thus, should cover not only the industrial firm alone but the entire industrial layer. The quality of the industrial layer is important in that it determines both the overall competitiveness of the industrial sector and the efficiency and effectiveness of industrial policies. Industrial policies are likely to fail if designed or implemented without taking into consideration the particular characteristics, weaknesses, and strengths of the industrial layer. In the remainder of this chapter the major components of the industrial layer are discussed.

9.1 The Industrial Entrepreneur

This section discusses the features of the 'industrial entrepreneur,' including brief case studies, and the policy implications. The industrial entrepreneur is the most important component of the industrial layer, as he is the one who establishes and develops the industrial firm. A lack of industrial entrepreneurs in number and quality could prohibit the start of industrialization, slow it down, or may also lead to a de-industrialization process.

The Entrepreneur and Economic Development in the Economic Literature

The concept of entrepreneurship has a long history in economic literature, going back at least to Cantillon (1755) in the eighteenth century. In the early discourses the entrepreneur was a person who entered into a contract with the state to provide goods or services. Adam Smith did not accord importance to the entrepreneur. Until von Thunen (1850) and Mangoldt (1855), there had been confusion in the role and function of the entrepreneur with that of the typical risk-taking merchant or capitalist. Jeremy Bentham's entrepreneur (the 'projector') was a person who, among other activities in pursuit of wealth, invented things. It was, however, Schumpeter (1934, 1947) who considered the entrepreneur as a key economic actor and he firmly integrated the dimension of innovation into the conceptual scope of the 'entrepreneurial spirit' (*unternehmers geist)*, while his precursors concentrated more on risk-taking, superintendence, and coordination.[1]

Schumpeter's theory of entrepreneurship is generally considered a synthesis[2]; his entrepreneur "did new and [commercial or industrial] things, or things that are already being done in a new way" and thus innovated by creating new products and processes.[3] In turn, his entrepreneur was the actor who broke down Schumpeter's stagnant circular economic flow and led to the construction of new ones and hence brought about growth and development. Importantly, Schumpeter defined the entrepreneur as endogenous to the economic system rather than exogenous[4]; he does not come from the moon but is a part and product of the society and economy.

On the other hand, Keynes, a more influential economist, did not accord a special or important role to the entrepreneur, just like Adam Smith. Perhaps with the influence of Keynes, entrepreneurship has kept management theorists and behavioural scientists busier than the economists in the twentieth century.

Nevertheless, since the second half of the twentieth century, a consensus emerged among economists that the entrepreneur and the entrepreneurial spirit is a key actor in economic development.[5] Following the Second World War, the depression in Europe led to an increase in interest in entrepreneurship, which was seen as a driver of growth.

The Commercial Entrepreneur and the Industrial Entrepreneur: The Same Breed?

The conjecture that the industrial sector and investments have some peculiarities compared to commercial ones begs the question of whether the 'industrial entrepreneur' is also different from the 'commercial entrepreneur,' and if so, what are the differences?

Papanek (1962) was among the first to underline this importance of the industrial entrepreneur:

> Discussion of economic development, since the revival of interest in the late forties, almost invariably starts with the acknowledgement that economic growth depends on a complex set of interrelated factors. With this out of the way, the tendency is to focus on a single key factor-not the only, but the most important, determinant of growth. The emphasis at various times and by various authors has been on technical knowledge, ideological fervour, natural resources, governmental organization, motives and attitudes, and capital. Emphasis has recently shifted to the key role of decision-making innovators, particularly in industry-in a word, entrepreneurs.

Successful entrepreneurs, either industrial or commercial, have some common characteristics such as the ones identified by McClelland (1987): proactiveness, doing things before they have to, showing characteristics that are part of an achievement motivation syndrome, and having a commitment to others. These characteristics may be one trait or behavioural basis.[6] Moreover, there is a consensus that the supply of entrepreneurs in societies may not be unlimited with respect to the need for them for economic development. Papanek (1962), for example, reminds us that "within any society only a limited number of individuals have entrepreneurial attributes in sufficient degree to be actual or potential entrepreneurs."

However, as the industrial sector is different from others, the industrial entrepreneur also requires different abilities, traits, and behaviour from the commercial one. Therefore, understanding the characteristics of the successful entrepreneur is critical in order to efficiently design industrial policies, including increasing the rate of generation of new industrial entrepreneurs (Table 9.1).

Hoselitz (2008: 125) argues that the industrial entrepreneur has broader abilities than the commercial entrepreneur. Singh (1989) finds that certain traits are related to faster industrial growth (such as emotional

Table 9.1 What the industrial and the commercial entrepreneurs face: some key differences

	Industrial entrepreneur	*Commercial entrepreneur*
Planning horizon	Longer	Shorter
Capital expenditure requirements, sunk costs	High	Low
Scale effects	Important	Less important
Risk categories faced	Technological risks, risks from low-cost manufacturers, commercial risks, employee relationship risks, regulatory risks, operational risks (quality, timing, etc.)	Commercial risk (mainly price)
Employee skills needed	Technical skills, commercial skills	Commercial skills
Technology selection	Important	Less important
Product development	Important	N/A

stability, self-assurance, upward striving, potential for change and development, hard work, tolerance for work pressure, and education), while others were associated with static or declining industrial growth (tender-mindedness, guilt-proneness, anxiety, hoarding tendency, high risk-taking, and traditionality).

Papanek (1962) has remarked that the "industrial entrepreneur is a distinct personality type. Potential entrepreneurs are not randomly distributed in society (as suggested by Schumpeter's analogy for the ability to sing)." Papanek's industrial entrepreneurs are not motivated entirely or even primarily by pecuniary motives in making their investment decisions. Instead, they are motivated by non-pecuniary motives such as achievement or recognition.

A potential entrepreneur may turn to an actual one if the non-economic obstacles, such as lack of security for person or property, are not deterrent, if they have access to the necessary resources, or if the government policies can sufficiently incentivize them economically. Moreover, again in parallel with Papanek (1962), entrepreneurship is a 'slow psychological phenomenon' and necessary conditions for the emergence of industrial entrepreneurs are a matter of social change.

If the supply of commercial entrepreneurs is limited in societies, the supply of industrial entrepreneurs must be even scarcer. Alexander (1967: 137) defines industrial entrepreneurs as the number of people involved in entrepreneurship, the size of resources at their command, and the efficiency with which these resources are utilized. He underlines three key factors that determine the supply of industrial entrepreneurs. The first is income per capita; the rate of growth (past and expected) of income per capita indicates the opportunities available to industrial entrepreneurs. He argues that a stagnant economy leads to incentives for entrepreneurship in redistributive activities, which is a zero-sum game for entrepreneurs. Industrial entrepreneurial activity, on the other hand, may lead to a positive-sum game by creating additional resources which add to per capita income. Optimistic growth expectations will increase the tendency to make new investments and innovate, and as coordination between entrepreneurs is not very strong, positive expectations may yield unexpected positive growth in industrial entrepreneurial activity, reinforcing each other.

Alexander's (1967) second factor determining the supply of industrial entrepreneurs is the economic/occupational structure of the economy; some economic/occupational groups tend to supply more industrial entrepreneurs than others. Thus, if the size of such groups is larger relative to the population in a society, one would expect relatively more industrial entrepreneurs. For example, he finds that in Turkey in the 1960s, the industrial entrepreneurs mostly emanated from the traders, and larger farmers and craftsmen were second in rank. Traders went into different industrial investments, while farmers mostly went into industrial investments in agricultural processing.[7]

According to Alexander (1967), the third factor determining the supply of industrial entrepreneurs is the non-economical, namely psychological and sociological, factors. In some societies, such as in German industrial sector, firms and entrepreneurs are quite reputable, in others, they are not. This 'reputation' determines the number of people who aspire to become industrial entrepreneurs or even an industrial employee.

If the supply of industrial entrepreneurs is simply not adequate the investments necessary for the industrialization process will be inadequate. That is, the effectiveness of industrial policy will critically depend on whether it adequately addresses the issue of the supply (in quality and quantity) of industrial entrepreneurs.

The Industrial Entrepreneur: Three Case Studies

Industrial entrepreneurs build industrial companies. In many cases their faith is intertwined not only with the faith of their companies but also their countries. This is most clearly demonstrated in the cases of Japan, Germany, and South Korea, three relatively late developed industrial countries. This section briefly reviews three industrial entrepreneurs in these three countries.

The Founder of Sony, Akio Morita (1921–1999)

Akio Morita was born in a wealthy Japan family of sake brewers. He was naturally expected to take over the family business. But rather than sake, Akio was interested in electronics, which was at its infancy in the first half of the twentieth century when Japan was in the process of industrialization. He later explained that his interest in electronics started at the high school with a phonograph that his father gave him as a gift. Akio studied electronics in his spare time and attempted to build his own radio, phonograph, and tape recorder.

Subsequently, he founded the Tokyo Telecommunications Co. with Masaru Ibuka with a capital equivalent to $500. The company's initial products included vacuum tube voltmeters, amplifiers, and tape recorders. He targeted overseas export markets early on and renamed the company to Sony to make it phonetically acceptable to the American market. In 1955, Sony introduced the first transistor radio, which helped it penetrate the consumer market.

From the beginning, Akio's Sony developed industrial products based on consumer preferences and needs. It ultimately became the world's largest electronics company in the 1980s against all odds, which included its origin in a relatively less industrialized country at the time. In the later stages of its development, Akio observed that the American consumer loved listening to music, including in their cars or even in the streets by carrying large stereos. He, innovatively, came up with an idea for a product that offered high-quality sound which was yet mobile enough. The result was the Walkman, which, before the iPod and the mobile phones, sold in millions globally.

More recently while Sony ventured into service and content businesses, it had difficulty in adopting to the new global market realities. The third CEO of Sony, Nobuyuki Idei, tried to redirect Sony to the new parameters of the global consumer electronics market during the 1990s by merging with Ericsson of Sweden. These efforts had mixed results and Sony ultimately lost its position as the world's largest electronic company.

Akio Morita's experience demonstrates three important characteristics of the modern industrial entrepreneur: a personal interest in manufactured products, targeting market and consumer trends, and an early and constant desire and effort for product innovation. The later stages of Sony as an industrial company shows that failing to keep in touch with the changing market trends and competition can be deadly.

Krupp: The Steel Empire of the Nineteenth and Twentieth Century

Friedrich Krupp AG was the largest company in Europe at the beginning of the twentieth century. It was established by Friedrich Krupp (1787–1826), but his son Alfred Krupp (1812–1887) enlarged the industrial empire to be the largest cast steel company in the world. The Krupp family had its origins as members of the gunsmith guild in Essen, Germany in the sixteenth century. Friedrich took over the family business at a very early age. He spent a large chunk of the family fortune to develop a new casting technique at the time when Great Britain was progressing in the Industrial Revolution. He was not successful and his endeavour caused major losses to the company.

Alfred tried to prevent the business from collapsing. At the same time, he tried the experiments of his father. In 1843 Alfred patented a cutlery roller (which made possible the mass manufacturing of cutlery) that helped the company's profits to rise. Krupp produced high-quality cast steel (crucible steel) and continued with manufacturing artillery, ammunition, guns, and other armaments. In 1847 Krupp developed its first cast steel cannon and, in the next few years, the size and quality characteristics of the Krupp cannons were developed substantially.

This made Krupp and its armament products world famous and the company grew armament production, which was the profession of the family's founders back in the sixteenth century. Armament industry and constant wars in Europe helped Krupp become the largest company in Europe in the nineteenth and twentieth centuries. For example, 1870–1871 Germany won the war with France with the aid of Krupp products. The Second World War also supported the growth of Krupp.

The development of Krupp, along with Thyssen, made the 'Ruhrgebiet' a centre of iron and steel heavy industries among the German states. Overall, Krupp's rise was in parallel with that of German economic development.

The Krupp experience demonstrates the importance of the industrial entrepreneur's effort to innovate in terms of both products and processes. It also shows the importance of entrepreneurship stamina. Krupp almost went bankrupt trying to develop a new industrial process. However, the ultimate success following years of failures made Krupp, and the industrial company, the largest enterprise in Europe. The Krupp experience also reconfirms the vital role of closely monitoring the market tendencies, in this case triggered by wars. Lastly, strong governmental support to Krupp shows the importance of industrial policies.

The Next Giant: Samsung and Lee Byung-chull

Samsung is the world's second largest electronics company after Apple in terms of revenues. In 2012, its revenues were higher than those of Apple's. In 2001, *Businessweek* named Samsung the world's top IT company.

Samsung was established by Lee Byung-chull as a trading company in the first half of the twentieth century in Korea when the country was a poor, unindustrialized country. Lee was born in 1910 as the son of a well-known rich landowner family in Korea. A dropout from Japan's Waseda University, at the age of 28, after a few trials, he started a trading business under the name Samsung, which meant three-stars. His firm grew quickly, becoming one of the largest firms in Korea and benefited from the Korean War. In those early years Samsung business concentrated in trading, although it had its own production of alcoholic beverages, flour, and confectionery and also ventured into insurance, sugar, and wool trading.

Starting in 1960 he made a trip covering Japan, Germany, Italy, and the USA[8] to meet with eminent business people and journalists and to observe evolving business trends. This might have been influential in his decision to establish the home appliances manufacturer *Samsung-Sanyo Electronics* in 1969, which was later renamed *Samsung Electro-Mechanics* in 1975 and merged with *Samsung Electronics* in 1977.

The group started manufacturing electronic semiconductors (chips) in 1974, which at the time were manufactured in very few countries in the world. In 1976, Samsung reportedly manufactured the one-millionth black-and-white TV set. In 1983, Lee announced that Samsung would be a DRAM (dynamic random-access memory) chip manufacturer; indeed, the company soon became the third manufacturer of 64 kb DRAMs in the world in 1984. The drive was based on R&D activities and continued over the years, making Samsung the manufacturer of the first 64 Mb DRAM in 1992 and of the first 256 Mb DRAMs in 1994.

In 1985, Samsung produced its first telephone, SC-1000, which was not a successful product. The next product, launched in 1988, SH-1000 was also not successful. Lee died in 1987 when his company was a rapidly growing electronics company mostly producing relatively cheap products. One of Lee's sons, Lee Kun-hee, replaced him. Kun-hee organized the famous three-day Frankfurt retreat for Samsung's top managers in 1993. The resulting 'Frankfurt Declaration' asked Samsung managers 'to change everything but their wives.' The key objective of Kun-hee was to raise the quality of Samsung's image and product quality.

Not happy with the product quality, in 1996 Kun-hee asked for $50 million worth of Samsung electronics products to be burned down in front of the main factory building and changed the CEO of the company. Kun-hee's strategy specifically targeted the development of two emerging product lines: LCD TV displays and mobile phones. Investing heavily in R&D, the company soon became a leader in both products globally. Samsung launched its first internet-ready mobile phone in 1998 and developed the high-definition digital TV in 2001. These strategies led to Samsung becoming the largest electronic company in 2012 and the second largest in 2015.

9.2 Industrial Labour

Industrial labour (workers, engineers, managers) is a critical part of the industrial layer. Manufacturing requires higher skills than non-manufacturing. Thus, just as the firm would need to invest in physical capital, it is also required to invest in human capital. However, unlike physical capital, the firm (industrial or not) can never guarantee that the human capital will stay with it. Therefore, firms tend not to invest adequately in human resources.

That is why the government needs to invest in technical and vocational education if it is to support industrialization. Germany and Sweden are possibly the best examples. Consequently, educational policies and industrial policies need to be well coordinated. In Japan, South Korea, China, and Turkey, among others, the government provided scholarships to engineering students studying abroad. In Turkey, these students worked for state-owned industrial firms such as Sümerbank before being transferred to private firms as founding engineers and managers of new textile plants.

9.3 Industrial Finance

Manufacturing industries need specialized finance. Commercial banks are bound by balance sheet constraints; the size and average maturity of their financing are limited by the characteristics of their deposit base. In many developing countries however, banking is the only major financial institution to which industrial and non-industrial firms can resort. That leads to the anomaly of weak access to finance.

For the industrial firms, weak access to finance presents itself in different forms. The simplest one is not receiving financing for physical or working capital financing. In other cases, firms finance their physical investments with rollovers of short-term financing or have to accept very high interest rates.

The policy implication is that industrial policies have to be coordinated with financial policies. The early industrialization experiences of Japan, Germany, and South Korea have specific financial policies that catered to the needs of the industrial development.

For today, this requires broadening the financial markets, institutions, and tools that compensate for the inadequacies of current commercial-bank-based financial systems in many developing countries. The development of capital markets would enable stock exchanges from which that industrial firms can obtain patient capital. Specialized development banks are crucial for both industrial lending and equity investments. Venture capital supports industrial innovation, while private equity helps middle- and larger-cap industrial firms to grow.

Notes

1. Landström (1999).
2. Landström (1999: 10).
3. Schumpeter (1947).
4. Gopakumar (1995: 9).
5. Gerschenkron (1953), Gopakumar (1995), Alexander (1960, 1967), Sagarra (1997).
6. Carland et al. (2002).
7. Alexander (1960).
8. Park-Barjot (2014).

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CHAPTER 10

Industrialization as Capacity Building: Skills, Technical Progress, and Technical Capabilities

Within the industrial layer, the industrial firm is a key determinant of successful industrialization.[1] Consequently, the design of the industrial policy should consider market failures arising from firm capabilities and should be selectively applied.[2] Industrialization is primarily a process of capacity building (of the industrial layer) with skill accumulation, technical progress, and physical infrastructure and superstructure as key ingredients (Fig. 10.1). Skill requirements rise as industrialization proceeds (middle panel of Fig. 10.2). That is why, in some countries such as Germany and Sweden, vocational education and the manufacturing sector developed in tandem or the former preceded the latter.

A successful industrialization process, which consists of forming an internationally competitive industrial layer, goes hand in hand with 'technical progress' (bottom panel of Fig. 10.2) in addition to simple capital deepening and the ensuing factor accumulation, which is only a visual aspect of industrialization, consisting of factory buildings and machinery. Technical progress means getting more outputs from the same amount of inputs in the country. That is, technical progress means more value added (more GDP) from the same amount of labour (population); a country with higher technical progress compared to another will command a higher per capita GDP.

M. A. Yülek, *How Nations Succeed*,
https://doi.org/10.1007/978-981-13-0568-9_10

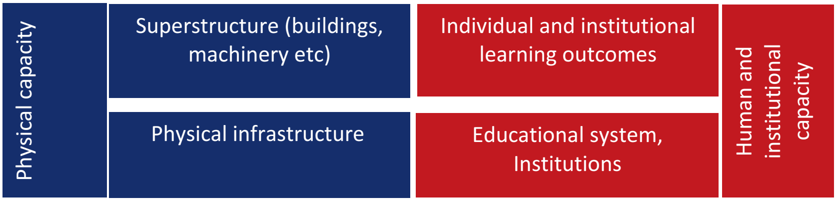

Fig. 10.1 Components of industrial capacity

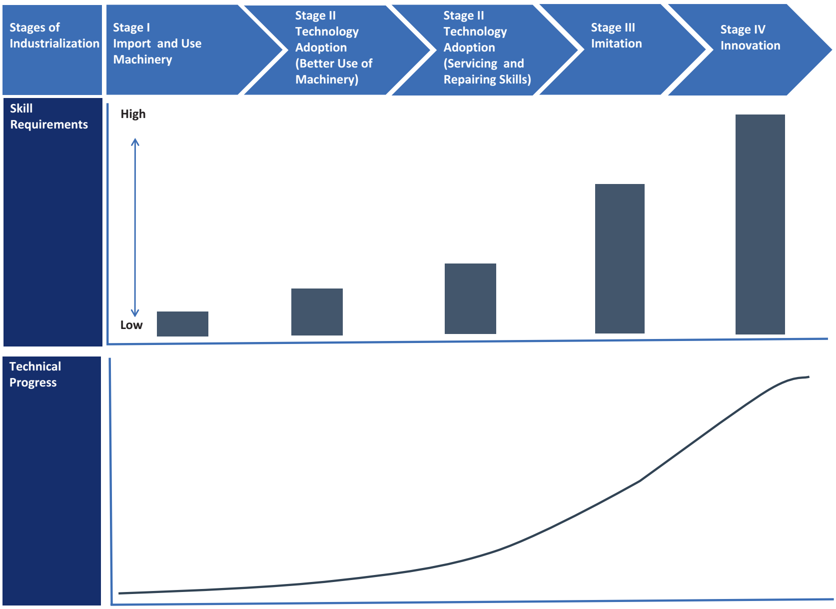

Fig. 10.2 Stages of industrialization, skills, and technical progress

Technical progress, in turn, is driven by technical capabilities, requiring critical skills (Table 10.1 and Fig. 10.3). The industrial layer accumulates technical capabilities to manufacture new, technologically more developed products or to manufacture the same products with new processes more efficiently.

Following Radošević and Yörük (2015: 5), the taxonomy of technical capabilities relating to the industrialization process can be divided into three categories (Fig. 10.3). Firstly, the 'production capabilities' are

Table 10.1 Technical capabilities: primary features and necessary skills

	Production capability	*Technological capability*	*R&D capability*
Primary skills			
Absorptive skills	●	●	
Manufacturing skills: ability to manufacture world class products	●	●	
R&D skills			●
Features			
Learning-by-doing spillovers	●	●	
Imitation		●	
Absorption		●	
Innovation: product and process improvement		●	
Innovation: generation of new products and processes (technology)			●
Activities			
Technology transfer activities		●	
R&D activities			●

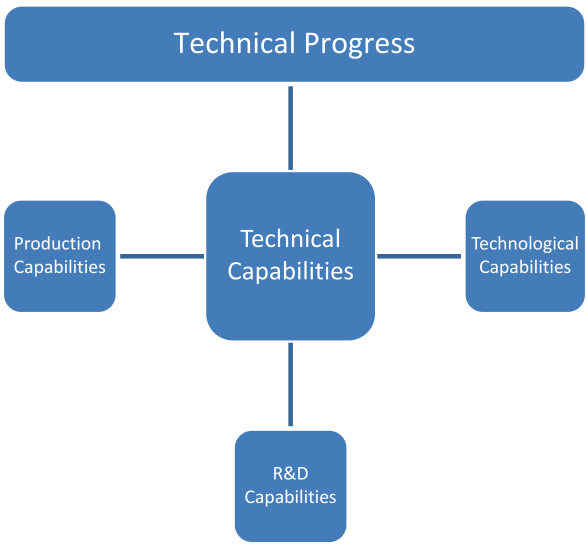

Fig. 10.3 Technical progress and technical capabilities

capabilities involved in manufacturing with a given level of technology at world levels of productivity. A skilled workforce is the key to operational efficiency. It is important that the productive capability is defined here for the given level of technology. Productive capabilities could encompass incremental improvements and innovation, and not 'fundamental changes' in products and production processes through product and process engineering. Advanced productive capabilities depend on skilled engineers (and not researchers).

The second category of technical capabilities is the technological capability (TC). It refers to operational commands to make effective use of technological knowledge in production and investment.[3] TC is critical for international competitiveness.[4] Whether development of new products or processes (innovation) is a component of TC is debatable. The appropriate definition seems to relegate innovation to a third capability, the R&D capability (RDC). However, TC should also include the capability to significantly change product and processes through 'unorganized' innovation and technology transfer (TT) and imitation (I) activities. TT and I activities benefit critically from the absorptive capacity (AC), which refers to the ability of a firm to recognize the value of new external knowledge, assimilate it, and apply it to commercial ends.[5] AC is critical to the firm's 'innovative capabilities' and is a function of the firm's prior level of related knowledge.

Thus, TC could be usefully defined as the ability to make effective use of technological knowledge in an effort to assimilate, use, adapt, and incrementally change existing technologies[6] through organized or unorganized innovation and TT and I activities. TC receives major inputs from SFL. In fact, for both the productive and the technological capabilities the key nurturing ground is the shop floor.

It is important to distinguish TCs at firm, industry, and national levels. While related to each other, TCs at these three levels may diverge. It may be possible, for example, that a firm in a country has unique TCs compared to its domestic and international peers while the average TC of the domestic industry may compare poorly internationally. But in general, such examples would be exceptional and TCs at all three levels would diverge substantially. National TC refers to capabilities at the level of the nation.[7] Thus, it would cover also TCs of the actors such as universities and the public entities complementing firm capabilities.

The third category of technical capabilities can be classified under RDC. Unlike the previous two classifications of capabilities, RDC is not primarily nurtured by the shop floor. It is critical for firms which are close to, or on, the world technological frontier (WTF). Countries and firms which are relatively far away from the WTF might prefer TT rather than own R&D.[8] This is because returns to TT spending—whose success depends on TC rather than on RDC—might command a higher return than R&D spending. As the firm gets closer to the WTF, its R&D activities and highly skilled personnel, cooperation with universities and research institutions, and intellectual property rights become more important success factors.[9]

R&D has two aspects, one being a driver of world frontier innovation and the other as a driver of I activities or a factor of AC.[10] One could argue that in developing countries TT would be a more critical driver of industrialization than RDC. However, as Radošević and Yörük (2015) argue, based on empirical evidence, to the extent that R&D improves the AC, it could also be a critical driver of industrialization in developing countries.

10.1 The Latecomer Industrial (Manufacturing) Firm, Technical Capabilities, and Learning

Manufacturing firms have played an important role in the transformation of western economies towards industrialized and developed structures and led the way for rapid growth.[11] During the last century new industrial firms with 'dynamic capabilities' predominantly in East Asia have successfully penetrated global high-technology industrial products markets. In other countries, very few firms have been able to replicate that success.

The rise of East Asian industrial firms to the global scene raises an important question: Why have firms in other countries not been able to record the same success? If the firm were a simple legal or organizational unit, as modelled in the microeconomic textbooks, one would have expected the emergence of globally competitive industrial firms in many other countries. The success of East Asian (and other) firms must be due to the build-up of certain firm-level skills; there must be something special about these industrial firms in overcoming substantial barriers to enter the global industrial goods markets and leading the industrialization process in a country.

Then, the question becomes: How does the firm build capabilities? In the mainstream explanation, the resource-based view, the firm builds a comparative advantage by picking resources and building capabilities, thereby creating economic rents. In the resource-picking strategy, the firm collects and analyses information to outsmart its competitors and designs and constructs organizational systems to enhance the productivity of the acquired resources. The firm then leverages resources to increase their efficiency in reaching the firm's growth goals.[12]

However, while the resource-based view of the firm presents a satisfactory explanation of how a firm may sustain its existing competitive advantages, it does not sufficiently explain how those competitive advantages have been created in the first place—especially how the 'latecomer firms' from East Asia broke into knowledge-intensive industries such as semi-conductors.[13] Mathews (2002) argues that the East Asian high-technology firms conducted their own sector-targeting strategies, together with the exploitation of linkages, resource leveraging, and learning. Thus, "their success in penetrating the global high technology product markets were not mere results of low factor costs or government subsidies" (which we should rephrase as industrial policies) "or just plain luck." Rather, their conscious 'organized learning' strategy helped them in successful penetration[14] as they pursued the strategic goal of "raising real incomes through catching up with the advanced firms, and moving as quickly as possible from imitation to innovation."[15]

Manufacturing firms, which come on the scene not as first–movers, have to overcome two key barriers: technology and branding. Both involve learning. The standard organization and management theory concentrates on the accounts of the success of the incumbents through concepts such as first-mover advantage, barriers to entry by industrial and technological advances and switching costs of consumers away from existing brands, and sustainability of existing competitive advantages.[16] However, the literature does not adequately concentrate on explaining how some of the 'latecomer firms' have succeeded in penetrating into high-technology markets dominated by the incumbents and overcoming all those barriers.

10.2 The Industrial Firm as a 'Learning Firm'

Learning is the main determinant of a firm's capability-building process. For the industrial firm, learning has a special role in building TC, which is a key determinant of competitiveness. The firm runs three distinct processes of learning. One is the standard SFL (or LbD[17]), whereby the unit manufacturing costs fall as cumulative production increases. The sec-

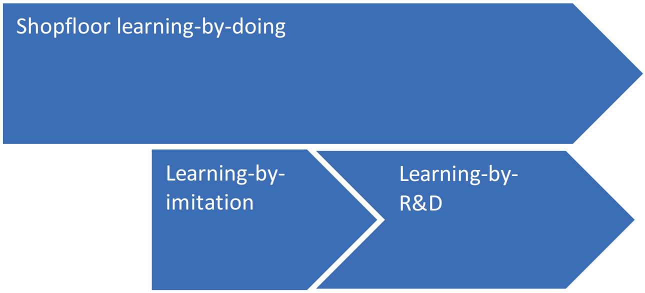

Fig. 10.4 The manufacturing firm's three learning processes

ond one is the learning by imitation (LbI), whereby the firm learns while manufacturing relatively complex products by imitating the products of more advanced competitors (Fig. 10.4). The third one is the learning by R&D (LbRD), whereby the firm learns when developing new products and processes through designated R&D activities.

The second and the third learning processes coincide with Kim's (2001) technological learning discussion. Kim (1997) summarized the process as follows for Samsung:

> Samsung leapfrogged from a mere discrete device producer to the most vibrant and largest memory chip producer in the world. It managed effectively the two antecedents of technological learning: prior knowledge base and the intensity of efforts. Samsung used technology licensing and the recruitment of high calibre scientists and engineers in building its prior knowledge base and crisis construction as a strategic means for increasing the intensity of its efforts. Samsung also used internal competition and cooperation to accelerate technological learning.

Following Kim (2001: 297), technological learning is the process of building and accumulating TC. Thus, conscious technological learning at the firm level drives TC and, in turn, TC drives the competitiveness of the manufacturing firm. Patterns of technological learning can be identified from the East Asian experience or those of other countries (Fig. 10.5).[18]

It is important to discern that the shop floor acts like a non-theoretical university; at the shop floor, new knowledge is produced and existing and new knowledge is disseminated to generations of workers. That is the same as the one of the key task of the university—and to some degree the secondary schools. Lack of manufacturing activities denies a country educa-

Fig. 10.5 Technological learning and technological capability

tion of that applied university. In many developing countries the state spends scarce resources to fund universities that are supposed to prepare manpower to work in the industry. Production facilities, in many cases funded by private investors, naturally acting as applied universities in fact can thus complement the state's (secondary and) tertiary education efforts.

The two 'universities,' the shop floor and the academic, are worlds apart in many countries. In the latter, the academicians are encouraged to produce scientific research that is uncoupled with the agenda of shop-floor university. The students are educated in a theoretical environment unaware of real-world situations. The shop-floor university, on the other hand, does not benefit from theoretically more equipped academicians in improving their productivity, processes, and products.

Exporting may also provide a source of discipline and pressure for the firm-level learning process, learning by exporting (LbE). Nevertheless, some form of institutionalization is necessary to increase and sustain gains. In East Asia, the latecomer firms' LbI and LbRD processes benefited from subcontracting and original equipment manufacturing (OEM) mechanisms acting "as a 'training school' enabling them to overcome entry barriers and to assimilate manufacturing and design technology."[19] They also benefited from LbE, which intensified "learning and acted as a focusing device for technological assimilation, adaptation and innovation. In contrast with the R&D and design-led strategies typical of leaders and followers, latecomers began with incremental improvements to manufacturing processes which led on to minor product innovations."[20]

The national capabilities are complex combinations rather than a simple sum of firm-level capabilities; they are determined by the interplay of incentives, firm-level capabilities, and institutions.[21] At the national level, in the initial stages of growth, SFL is very important in gaining competitive advantage. In the more advanced stages of development, acquisition of technological knowledge becomes the critical competitive factor. This is driven by the international capabilities of the manufacturing firm through the learning processes rather than through mere production capacity.[22] Thus, firm-level LbI and LbRD, when summed up, lead to enhanced TC at the national level.

Notes

1. This chapter draws on Yülek (2017).
2. Lall (1992).
3. Yun (2007).
4. Kim (2001: 267).
5. Cohen and Levinthal (1990).
6. Yun (2007: 34).
7. Lall (2000).
8. Reinstaller and Unterlass (2012).
9. Reinstaller and Unterlass (2012), Radošević and Yörük (2015).
10. Cohen and Levinthal (1990).
11. Chandler (1990).
12. Barney (1991), Makadok (2001), Hamel and Prahalad (1992).
13. Mathews (2002).
14. Mathews and Cho (1999).
15. Kim (1997), Mathews (2006).
16. Mathews (2006: 468).
17. Wright (1936), Arrow (1962).
18. Kim (1998, 2001), Hobday (1995), Kim and Nelson (2000), Bell (1984), Hitt et al. (2000).
19. Hobday (1995).
20. Hobday (1995).
21. Lall (1992).
22. Bell and Pavitt (1992).

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CHAPTER 11

The State and State Capacity

The state: What is it? Why does it exist? These have been questions frequently revisited by philosophers, political scientists, and more recently economists. The questions of whether and how much the state should intervene in the economy (which is debated by economists varying from Adam Smith to Karl Marx), and in particular whether it can be useful in economic development (discussed by economists such as Friedrich List, Arthur Lewis), have been even more controversial.

The state designs and implements industrial policy with a view to push industrialization and consequently economic development. Thus, the level and quality of the state's capacity (or capability) to pioneer, drive, or at least support industrialization are crucial in achieving successful industrialization and thus economic development in general.

On the other hand, a strong industrial layer will enable the success of the industrial policy and a healthy and comprehensive industrialization. The corollary is that if the industrial layer is weak industrial policy may be doomed. Thus, it turns out that considering industrial policy as a set of measures independent of the formation and development of a strong industrial layer may seriously jeopardize the effectiveness of policy.

The state with adequate 'capacity' which realizes the importance of the industrial layer can be a significant force behind the formation of the industrial layer, which consequently can ensure successful industrialization.

On these lines, this chapter discusses the dimensions of the state's capacity to design and implement policies.

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https://doi.org/10.1007/978-981-13-0568-9_11

11.1 State Capacity and the Developmental State

The concept of state capacity has received attention among political scientists, who considered it a crucial characteristic of a political system.[1] At a general level, state capacity can be defined as "the ability of a government to administer its territory effectively."[2] In practical terms, one aspect of state capacity refers to the power of the state in mobilizing financial resources from people in a legitimate and, if necessary, coercive way. This is referred to as the 'extractive capacity' of the state. The second aspect of the state capacity, however is to direct the mobilized funds towards the achievement of what "the central policymakers perceive as the national interest."[3] That is more important, as it represents effectiveness in reaching policy objectives which have a societal meaning.

Historical experience shows that more often than not, state decision makers in different countries have used the extractive capacity of the state to finance war and expansion or to achieve other political objectives that dominated objectives related to economic development. However, long-term economic development has nevertheless also been a major occupation of the state in many countries. That is referred to as the state's 'steering capacity,' which is the capacity "to guide national socioeconomic development."[4]

Consequently, state capacity is more appropriately defined as "the ability of policymaking authorities to pursue domestic adjustment strategies that, in cooperation with organized economic groups, update or transform the industrial economy."[5] That is very close to the concept of 'developmental state' as minted by economist Chalmers Johnson when explaining the rapid industrialization and economic development in Japan after the Second World War. To Johnson (1982), Japan's 'plan-rational' developmental state is one for which the achievement of rapid economic development was a high priority. That was possible through an elite bureaucracy that would intentionally 'guide the market' by getting the 'prices wrong' intentionally.[6] In other words, the Japanese developmental state aimed to build up dynamic comparative advantage in selected priority industrial sectors or products rather than leaving its resource allocation decisions to current market prices.

A developmental state does not necessarily mean an autocratic or a statist one. Successful developmental states (mostly in East Asia), while exerting considerable influence on the domestic financial institutions,[7] were careful to establish consultation mechanisms with the private sector.[8] In the process, in consultation with the private sector, the (elite) bureaucrats were responsible for policy design, while ruling politicians maintained political stability by providing the bureaucrats with a conducive political and economic environment and conveying them the needs of the social and political groupings.

Maria Mazzucato has extended the developmental state concept, stressing the pioneering role of the state in leading the firms to high-technology areas. Investment in high-technology areas is considered too risky and costly by firms, which are concerned about how to internalize the returns (i.e. how to reap more profits) if successful. Significant initial R&D investments are necessary in those areas to achieve returns but success rates are very low. Thus, an *entrepreneurial state* levels the ground by funding R&D, enabling the entry of the firms to the high-technology areas by lowering initial private R&D risks and costs. Mazzucato's (2015) work revealed that every key technology (such as the internet, GPS, touch-screen display and the voice-activated Siri) underlying iPhone's success was funded by the American government, which is generally described as an economically non-intervening state.

Mazzucato's argument is not much different from Adam Smith's, who underlined that where public goods are concerned, lack of state intervention would lead to undersupply. Thus, policies involving state subsidy can efficiently increase the supply of public goods (including of R&D) to the society.[9]

11.2 Steering Capacity

The state—whether developmental, entrepreneurial, traditional, or having whatever characteristics—designs policies and implements them by continuously taking decisions and monitoring results. When compared to the original policy objectives, the achieved results determine the level of effectiveness of the institutional capacity of the state. On the other hand, the results that are obtained relative to resources employed signify the efficiency of the process, which is also related to the same institutional capacity of the state.

It is arguable that the magnitude of the steering capacity of the state can determine or at least significantly influence the pace of economic development. In particular, the success of industrial policy in different countries in the recent or distant past has a lot to do with state success. In East Asia, Sweden, and Germany, among others, state capacity has arguably been one of the main defining factors of successful economic development.

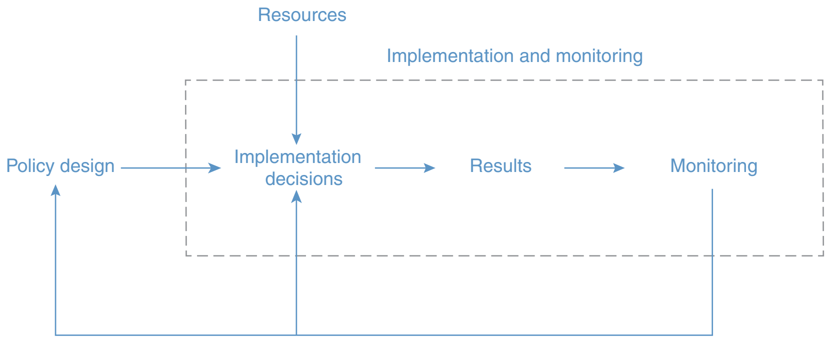

Fig. 11.1 The steering capacity of the state: policy design and implementation process

The quality of the steering capacity depends on the quality of both the policy design and the implementation (Fig. 11.1). The results that are achieved determine the 'developmental impact' of the resources employed. The effectiveness (the level of satisfaction with the results obtained) and the efficiency (results obtained in relation to the resources employed) are determined by the steering capacity of the state.

Things often do not go as planned due to many reasons: design mistakes, inadequacy of inputs deployed, insufficiency of the implementation capacity, and so on. Therefore, the quality of monitoring, which is also an important component of steering, is crucial. Monitoring may lead to corrections in the implementation or, more substantially, reforms in policies.

11.3 Market Failure Versus Government Failure

Markets fail, and so do governments. Following the collapse of the markets during the Great Depression, Keynesianism and government intervention strengthened. Higher involvement of government in the economy helped positive social outcomes emerge. However, in time, extensive intervention and government's institutional limits started to generate negative costs for the society and slowed down overall productivity growth in the economy. Budget deficits and mounting public debt were the other significant outcomes.

So failed the government, and in the late 1970s and early 1980s, starting especially in Margaret Thatcher's Great Britain and Ronald Reagan's USA, a new round of liberalization wave started. For a while things went very well; in particular growth resumed. But market forces unchained by liberalization soon led to different problems in different countries; hyperinflation and high inflation continued for quite a while, income distribution and poverty outcomes worsened in many countries, and financial crises emerged. By the global financial crises in 2007, it was clear to many (again) that markets could also fail.

The failure of governments shows itself through their policies either in terms of design or in terms of implementation quality. And failures speak louder than successes. In Europe many successful government policies went without proper acknowledgement. Some historical ones were explained in the first part of this book. Some other, more contemporary ones that directly targeted sectors and products are explained as case studies in this part of the book. The successful development of East Asian countries happened by significant government intervention.

In fact, one could imagine no economy—except perhaps in Alice's wonderland—where there is no government intervention with both short- and long-term economic objectives. Government intervention has, no doubt, societal costs. But that is also the case for fully market-based solutions. So, the question becomes how to make the most out of policies and generate positive net impact for the society. That is determined by the state's developmental capacity.

11.4 The Educational System

The educational system is a product of the state whether or not the participation of the civil society occurs during its formation and management. And it is a key determinant of successful industrialization and economic development.

Education is a public good. Public goods are defined as goods whose consumption by one person does not deter the consumption of others. Public goods create market failures; people want to consume the public good, but they do not like to pay for it. Thus, there is a role for government to provide the market with public goods such as education; a completely free market would lead to an undersupply of education.

Educational public good is defined by not only the quantity (number of classrooms and school buildings or school attendance) but also the quality. Education and economic development are positively related. While measurement of the quality of education proved to be a critical aspect of determining the impact of education on economic development,[10] there seems to be a strong relationship between not only quantity but also quality of education and economic development (measured by per capita GDP). The empirical study by DiCorrado et al. (2015) reports a positive relationship between the quality of STEM (science, technology, engineering, and mathematics) education and per capita GDP.

Industrialization is a capacity-building process. Capacity building occurs in people, and the key process of capacity building is learning. The educational system provides the key input to the industrial sector: skilled labour in the form of industrial workers, engineers, and managers. It is thus no surprise that successful industrialization (and economic development in general) experiences have always been accompanied by a good educational system. Moreover, reforms in education tend to precede economic development. Germany, Sweden, Korea, Finland, and the USA are some of the major examples of that.

German Educational System: A Good Case of How Education Supports Business and Industry

Germany is possibly the best historical example elucidating the positive role of education in industrialization. Prussian educational reform started before the country's industrialization. It was so much so that today there is still a debate, in the USA, on the country's current educational model ('the factory model'), which was imported from Prussia in the nineteenth century by Horace Mann, an American Congressman and educator who studied the Prussian system and visited the country. Prussian education reforms had been a sensation in Europe. Victor Cousin (1836), for example, analysed it and authored a report in France that was later translated into English, inspiring Horace Mann and other interested American leaders.

Prussian educational reforms go back to the beginnings of the eighteenth century during the reigns of Frederick William I and his son Frederick the Great. In 1716, state-financed public education (*Volksschulen*) was made compulsory in Prussia. Part of the reason for the reforms was, no doubt, to strengthen the unity and power of the fledgling Prussian state and render the Prussian populace obedient to authority.[11] But it was also the case that the reforms led to a populace ready to grasp industrial and technological development. In time the vocational aspects of the Prussian (and subsequently German) educational system were further developed. The system not only made possible but also strongly encouraged—and sometimes made mandatory—the practical experience of the students in the industry.

From the beginning, the Prussian elite were aware of the importance of education. Emphasizing the crucial role of education in industrialization, Friedrich List (1841: 113) set out the importance of the intellectual capital in industrialization:

> Adam Smith has merely taken the word capital in that sense in which it is necessarily taken by rentiers or merchants in their book-keeping and their balance sheets … He has forgotten that he himself includes (in his definition of capital) the intellectual and bodily abilities of the producers under this term. He wrongly maintains that the revenues of the nation are dependent only on the sum of its material capital. (p. 183)
>
> The present state of the nations is the result of the accumulation of all discoveries, inventions, improvements, perfections and exertions of all generations which have lived before us: they form the intellectual capital of the present human race, and every separate nation is productive only in the proportion in which it has known how to appropriate those attainments of former generations and to increase them by its own acquirements …

Freeman (1995: 6) underlined List's ideas on cruciality of education in shaping the German industrialization:

> It was thanks to the advocacy of List and like-minded economists, as well as to the long-established Prussian system, that Germany developed one of the best technical education and training systems in the world. This system was not only, according to many historians, (e.g. Landes 1970; Barnett 1988; Hobsbawm 1968) one of the main factors in Germany overtaking Britain in the latter half of the nineteenth century, but to this day is the foundation for the superior skills and higher productivity of the German labour force (Prais 1981) in many industries.

The German education system continues to support the country's heavily industrial economy, though there are criticisms and debates on reform needs.[12] The schooling is compulsory and free for students from the ages of 6 to 15. Graduating from the elementary school (*Grundschule*) the students are directed by their teachers based on the students' academic performance and personal traits to one of the three possible streams: the

Gymnasium (which is a highly academically oriented stream that ends up with university education), the *Realschule* (relatively less academically oriented stream, typically proceeding to a vocational secondary school and perhaps subsequently to an *Fachhochschule* [applied university]), or the *Hauptschule*, which is for the students with less academic aptitude, typically leading to relatively lower-skill jobs after receiving a secondary school diploma. The German education system highly cherishes vocational and applied aspects of learning and is designed to align its curricula with the needs of business and industry (Fig. 11.2).

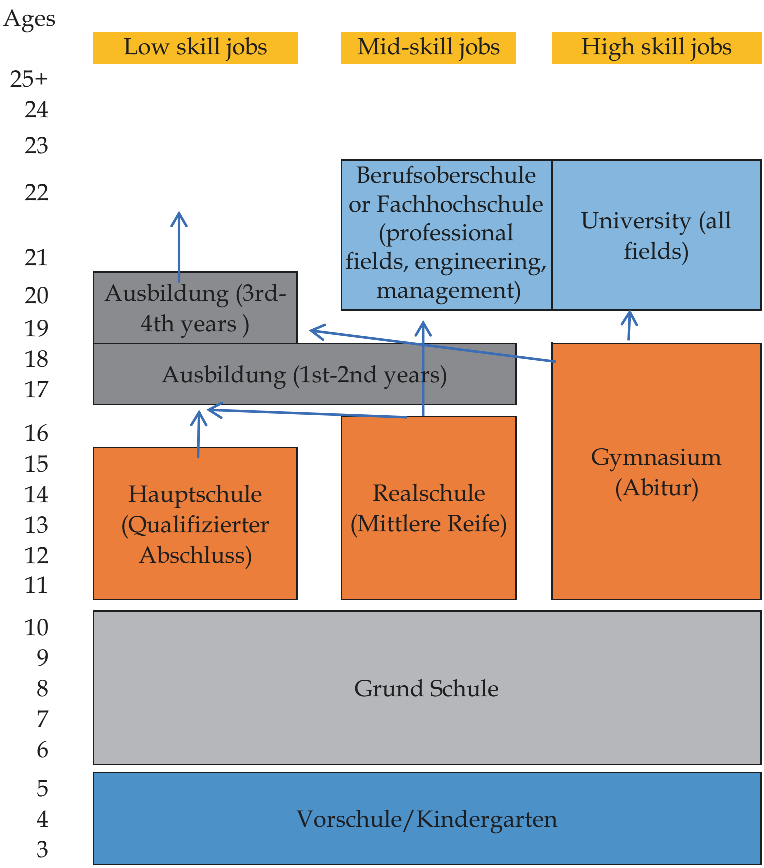

Fig. 11.2 The current German education system

Notes

1. Wang (1995), Almond and Powell (1966), Katzenstein (1977), Zysman (1983).
2. Skocpol (1985), Wang (1995).
3. Wang (1995).
4. Wang (1995).
5. Weiss (1998: 5).
6. Johnson (1982), Amsden (1992), Wade (1990).
7. Yeung (2017).
8. Evans (2012), Yeung (2006).
9. Andreoni and Bergstrom (1996).
10. Benos and Zotou (2014).
11. Boli et al. (1985), Meshchaninov (2012).
12. For example, the German education system is criticized to be unequal and involving barriers of access to education based on the origin or the immigrants' background (Fernandez-Kelly 2012).

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CHAPTER 12

The '*How*' of Manufacturing: Industrial Policy

This chapter discusses why and what kind of industrial policy is needed at what stages along the industrialization process? It also discusses the sequencing between industrial policy on the one hand and science, technology, and innovation (STI) policies on the other. Should they be used concurrently? Can STI policies be effective in a less industrialized country? Finally, the chapter proposes a methodology on how strategic sectors can be selected by policy makers. Do all manufacturing subsectors have the same developmental impact? Or, are some subsectors different from others? If so, how can these strategic sectors be identified?

12.1 Why Industrial Policy in Developing Economies? The Middle-Income Trap

In developed economies, industrial policy is back in the policy agenda. In the EU, for example, after retreating between 1990 and early 2000s, industrial policy reclaimed an official position in the policy agenda in 2002 with the objectives of reviving productivity and growth and increasing competitiveness.[1] Following the global financial crises, the EU's industrial policy effort intensified as growth further diminished. In the USA, in addition to defence-related industrial policies, policies to support technology and advanced manufacturing were adopted during Clinton and Obama administrations to enhance the country's competitiveness.

M. A. Yülek, *How Nations Succeed*,
https://doi.org/10.1007/978-981-13-0568-9_12

In developing countries which need growth to catch up, unnecessary imports cause slowdown, as discussed in Chap. 6. The costs of slowdown are higher in developing countries than in developed ones, as it impedes the needed catch-up process. Worse, if the import-led slowdown is systemic and sustained, then the developing country risks falling into the middle-income trap, which is a critical impediment to sustained growth.

The persistence of the gap between the per capita income levels of developed and developing countries has attracted the attention of economists.[2] In many developing economies, the growth of per capita GDP has been quite volatile and its average value in the long run remains relatively low.[3]

As empirical studies have demonstrated, a typical growth path for relatively successful low-income countries helps them reach the middle-income threshold, but then they slow down, keeping the country in the middle-income levels for protracted periods of time.[4] This is symbolized in Fig. 12.1 by the fall in the steepness of the growth trend when the economy reaches the middle-income level.

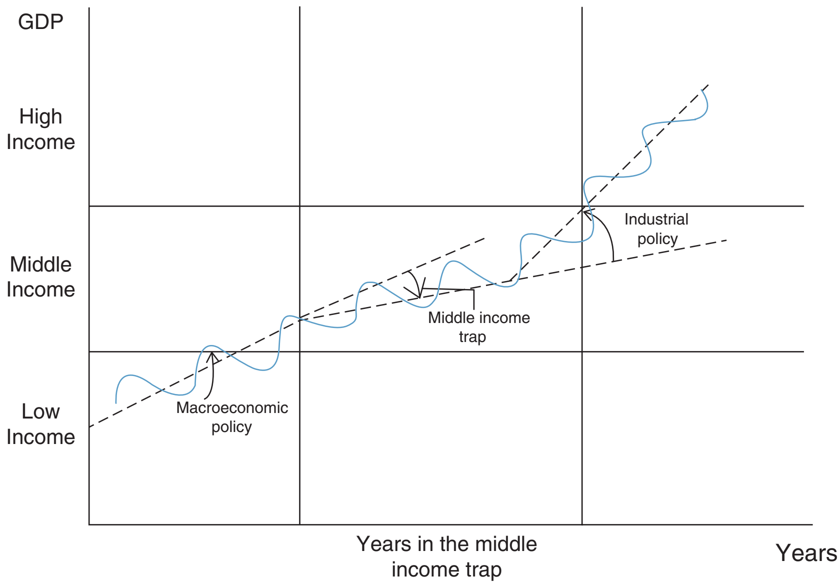

Fig. 12.1 Industrial policy and the middle-income trap

In fact, this so-called middle-income trap has been successfully avoided by very few countries in the world such as Finland and Sweden in Europe and Japan, South Korea, Taiwan, Hong Kong, and Singapore in East Asia. In other words, avoiding the middle-income trap has proven to be the exception.

Economists Eichengreen et al. (2012, 2013) made some empirical estimations and reached the conclusion that there are two middle-income traps at $15,000–16,000 and $10,000–11,000 (in constant 2005 prices) levels. They argue that the growth of the per capita GDP in the middle-income countries and in many of the developing countries gradually fall after these thresholds. Calculations show that countries may stay in the trap for quite long periods; for example, Bulgaria, Costa Rica, and Turkey have remained there for 50 years.[5]

A limited number of studies examined the possible key factors helping countries avoid the middle-income trap.[6] Their results suggest that some basic factors such as the level of education in the society, physical infrastructure, and macroeconomic framework may play a role in getting out of the middle-income trap or never falling into it. More importantly, efficient transfer of labour from agriculture to knowledge-based manufacturing sectors, R&D infrastructure, and industrial policies are also important factors.[7]

The results of an empirical study by Hausmann et al. (2005) can be interpreted to suggest that typical market reforms consisting of liberalization of financial markets and trade are not a significant determinant of growth accelerations that might help countries get out of the middle-income trap. On the other hand, macroeconomic (consisting basically of monetary and fiscal) policies have a short time span and their primary scope of action is to eliminate the output gap rather than adding to the long-term growth performance of the economy.

In contrast, the industrial policy, as other structural policies, is designed and implemented in order to improve the long-term growth performance of the economy. In particular, it can help countries surmount the middle-income trap (Fig. 12.1) by raising the growth performance over the long term due to certain characteristics of the manufacturing sector. This is based on the growth-friendly nature of the manufacturing sector (Kaldor 1966, 1967).

The 'traditional' (sectoral) industrial policies played a significant role in the developmental performance of Japan between the 1953 and 1973 high-growth periods.[8] On the other hand, in the 1960s and 1970s European countries resorted to national champions and sectoral industrial policies (in sectors where European firms were far from the technological frontier) were employed in order to catch up with the US economy.[9]

12.2 Is a Country Certain to 'Naturally' Industrialize in the Full Range? General and Sectoral Industrial Policy Along the Industrialization Process

Industrialization, as a Kaldorian engine of growth, assisted the developed countries of today to increase their productivity and income levels. It may also assist today's developing countries, some of which face the risk of premature de-industrialization.

De-industrialization is primarily a problem of developed economies and shows itself in the form of falling shares of manufacturing in total employment or in GDP. However, there is evidence that lower-income countries also face the risk of a 'premature de-industrialization,' comprising a shrinking manufacturing sector before it reaches the relative levels where the advanced economies began to de-industrialize.[10]

If industrialization can help reaccelerate the growth rates and take the developing country out of the middle-income trap, a natural question is whether or not specific policy, in particular industrial policy, would be warranted to trigger industrialization.

Earlier stages of industrialization are easier to undertake than later stages. Manufacturing goods without using capital goods is nowadays limited to very a few societies in remote parts of the world. In today's world, thus, Stages I and II (Fig. 12.2) are relatively easy and even natural for countries where international manufacturers of machinery offer their products to the international market and with abundant financing opportunities; developing countries have ample opportunities to import machinery and increase capital deepening along Stages I and II. Moreover, transition from Stage I to Stage II mostly involves relatively simple learning processes and is a matter of the passage of adequate time for labour and firms to work with machinery.

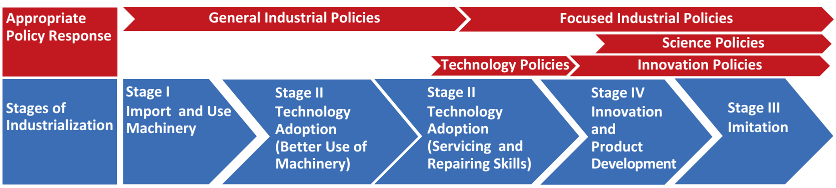

Fig. 12.2 Industrial and STI policies along the industrialization process

The difficulty arises in the transition from Stage II to III and III to IV. This is because that transition requires not only larger amounts of physical and financial capital and competition with international incumbents, but also capacity building consisting of larger human capital investments and a build-up of TCs ties at the firm and national levels. Thus, as empirical evidence based on country experiences show, countries are not assured naturally to reach Stage III or Stage IV. This can be called the 'non-industrialization trap,' which is likely to coincide with the middle-income trap. Moreover, countries are prone to losing certain manufacturing industries over time due to losing cost competitiveness—the de-industrialization.

Thus, there is a role to be played by the industrial policy along all of the Stages I–IV; however, it is particularly important in facilitating passage from Stage II to III and III to IV. The reasons are that several factors provide convenient conditions for these earlier stages of industrialization: (i) Stages I and II require relatively less policy support, as the supply of low cost labour is available in newly industrializing countries, (ii) these countries have opportunities to join global value chains with their competitive labour costs, (iii) the aforementioned availability of supplier loans financing the machinery imports, and (iv) foreign direct investment (FDI) inflows.

Starting with Stage III, technical capabilities start to become critical. There is probably a bi-directional relationship between technological progress and industrialization. Technological progress is driven by factors that are endogenous to the manufacturing activity (such as by LbD) as well as by exogenous factors such as demand (e.g. tendency of public and private procurement agents to resort to foreign rather than locally manufactured goods), private and non-private R&D activity, and the general education system in the country.

In Stages III and IV, exogenous technological progress drivers become critical and the need for an industrial policy to address these issues becomes more prevalent. It is theoretically possible and empirically evident that a country may fail to raise its technical capabilities beyond critical levels. As a result, it may fall into a 'low-technology trap' or a 'middle-technology trap.' In turn, the low- or middle-technology trap may be a key reason why a country may fall into the 'non-industrialization trap.' These can be considered as market failures that necessitate industrial policy for the achievement of the second best.

In addressing the above challenges, it can be said that industrial policy becomes a more important driver of the industrialization process starting with Stage III. Its targets in terms of technical capabilities and sectoral focus should be appropriately adjusted along the industrialization process; sectoral focus is particularly necessary if the country wants to move beyond Stage II. Moreover, industrial policy and STI policies should be appropriately sequenced in order to address the relevant needs of the industrial sector (Fig. 12.2).

Industrial policy primarily aims at changing the production structure of the economy in favour of the manufacturing industry by channelling the government's selected budgetary and non-budgetary resources and by channelling labour towards the manufacturing sector. In fact, such a definition would more correctly referred to as a general 'industrial(ization) policy' (Fig. 12.3), which would comprise a set of incentives that are expected to render private fixed capital investment into the manufacturing sector as a whole (i.e., without targeting specific industrial subsectors), attractive to entrepreneurs and businesses, or at least to compensate for some of the disadvantages that manufacturing investments have over the non-manufacturing sectors.

The decisions of the industrial entrepreneur are not made in a vacuum. The industrial entrepreneur would decide to invest (and take risks) in a sector if non-economic obstacles were removed to a sufficient degree.[11] The non-economic obstacles to investment carry costs for the entrepreneur. In

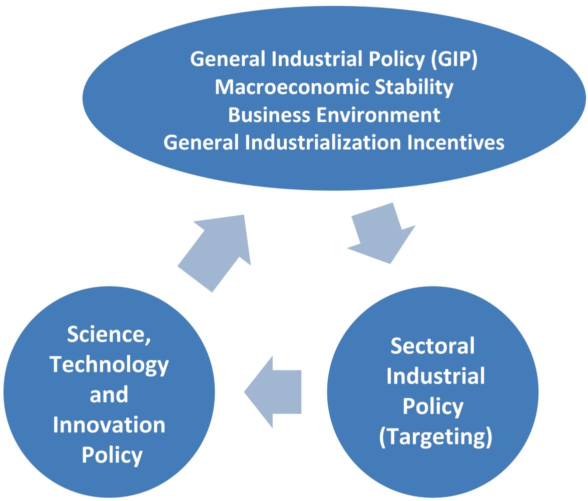

Fig. 12.3 The layers of industrial policy

a feasibility study, they would appear as negative factors, reducing the overall returns to the investing firm and thus jeopardizing the feasibility of the investment. General industrial incentives which have been employed in many countries have been supposed to raise the attractiveness of industrial investments by raising the overall private returns. Industrial policies, in general, thus, would aim at reducing the costs of non-economic barriers to manufacturing investment and increasing the attractiveness of manufacturing investments to private investors. Thus, they provide a more conducive environment to the industrial entrepreneur and the industrial layer.

However, the primary reason to employ industrial policy is not only to change the composition of the overall GDP in favour of the manufacturing sector, but also to change the subsectoral composition of the industrial (manufacturing) sector in order to increase the value added generated by the existing set of resources. Thus, the 'traditional,' 'sectoral,' or 'focused' industrial policies consist of 'targeting' certain subsectors or products of the manufacturing sector and supporting them by various tools. These more focused industrial policies have also been referred to as 'picking the winner.' By this, limited budgetary resources can be used more efficiently and effectively.

If the targeted sectors are selected 'properly', positive externalities (which can be called 'extra-sector externalities') can be generated while building capacity within the realm of the targeted subsectors. Such externalities increase the societal returns reaped from the industrial policy. They would also reduce the costs of 'wrong' (sub)sector selections as extra-sector spillovers would generate social returns in other (sub)sectors. As an example of such positive extra-sector externalities, US defence and space policies (which are industrial policies in disguise, as mentioned before) seemingly do not generate economic benefits directly to the society but provide technological externalities to other sectors.

Though there are many critics of picking-the-winner policies for well-known reasons,[12] the USA and some European and East Asian countries, particularly Japan (in the second half of the nineteenth century and the third quarter of the twentieth century) and Korea (between 1962 and 1997), have designed and implemented them successfully. Their policy experiences led to a drastic change in the overall economic structure and economic performance, including (i) high GDP growth rates, (ii) a significantly higher share of industrial sector in the overall GDP and in exports, (iii) a substantially different subsectoral structure of the industrial sector and composition of exports,[13] and (iv) increased international competitiveness of the country's manufacturing firms.

A related set of tools comprises the STI policies whereby governments allocate budgetary funds to assist private firms' R&D activities in order to develop innovative products, processes, and technologies. These are generally regarded as cross-cutting ('horizontal') policies without a sector preference. However, technologies which are supported and those which are not nevertheless relate to some manufacturing sectors more than others. Thus, they can be considered to be also somewhat related to the industrial policies.

12.3 How to Pick the Winner? Strategic Manufacturing Sectors

How can a policy maker select the 'strategic' sectors or products? While targeting sectors have been both praised and criticized, this key question has not been adequately dealt with in the economic literature. Strategic sectors may, for example, be defined based on national security concerns. For example, in the USA, defence and related sectors are considered strategic.[14] However, strategicness of a sector based on national security considerations may not coincide with its strategicness in economic terms. According to some, a technologically sophisticated sector is automatically a strategic one. However, that is also quite vague and inadequate in assessing the overall economic merits of a sector.

Based on the foregoing discussion on the industrialization process and technical progress, the design of industrial policy should take into consideration a number of important factors, including the capability-building aspects. These factors can be quantified to reach an overall 'sector strategicness index' in economic terms that may be used to build sectoral rankings or make comparisons. Sub(sector) targeting (picking the winner) can then be based on such rankings in order to achieve maximum long-term benefits for the economy.

Here a framework is proposed based on four factors:

(i) Value added potential which directly feeds into per capita income or its growth rate in the overall economy,
(ii) backward linkages,
(iii) depth (potential) of LbD, and
(iv) depth (potential) of technological learning.

Each can be scored as a standardized index (e.g. ranging from 0 to 100) and combined under a simple functional form in order to determine empirically the importance of the sector or product:

$$S_i = \beta_{\mathrm{EVAP}}\mathrm{EVAP}_i \times \beta_L \mathrm{Li}_i \times \beta_{\mathrm{LbD}}\mathrm{LbD}_i \times \beta_{\mathrm{TD}}\mathrm{TD}_i$$

where S_i is the estimated strategic importance of sector/product i, EVAP_i represents the economic value added, Li_i represents the 'linkages,' LbD_i represents the 'learning potential', and TD_i represents the technological depth of the sector or product. The coefficients β represent the weight given to the specific factor by the policy maker; they should add up to 1.

The reason for the multiplicative formulation is straightforward. Hypothetically, a product may have one or more factors with zero or very low indices (e.g. a very low EVAP). That should diminish or even eliminate the overall strategic importance of the sector for the decision maker. In other words, a zero or close to zero multiplicative strategicness for a sector should lead to its elimination from the list sectors of strategic priority.

An alternative formulation to eliminate the risk of an unwarranted overlooking of an otherwise strategic sector or product which has a zero (or very low) value for one of the four indices but has very high levels of strategic importance in terms of the remaining three factors can be considered as:

$$S_i = \mathrm{EVAP}_i + \mathrm{Li}_i + \mathrm{LbD}_i + \mathrm{TD}_i$$

or

$$S_i = \alpha\left(\mathrm{EVAP}_i + \mathrm{Li}_i + \mathrm{LbD}_i + \mathrm{TD}_i\right) + \mathrm{EVAP}_i \times \mathrm{Li}_i \times \mathrm{LbD}_i \times \mathrm{TD}_i$$

where α is a standardization coefficient between the additive and multiplicative combinations of the indices of appropriate size.

In what remains of this section, each of the four factors will be discussed and will be linked to the main question, that is, how the policy maker can select the strategic sector and base itself in assigning index values to each strategic factor.

Economic Value Added Potential

A key variable determining the strategic importance of a sector/product is the potential of economic value generation it offers to the manufacturer and the economy. Different firms and sectors take roles in different parts of the value chain. Ultimately, the structure of the value chain defines both the final price of the product (to the end-user) and the value-added contributed by each firm and sector in the chain. The same product in different countries may be subject to different value chain structures and two firms which take a role in a similar part of the value chain in two different countries may create different levels of value added. By putting a cap on the final product price, the competition in the final product market can also significantly affect value generated by firms in the value chain.

The metric which measures the value generation of a firm/sector i is the ratio of the total value generated (value added) to the total sales of the firm/sector; it can be called the *value generation rate* (VGR_i). The higher this ratio, the higher is the potential of generation of total value added by the production of more product(s). That, in turn, would directly translate into a higher GDP and GDP growth. Nevertheless, there are obviously upper boundaries to value generation; for example, if the level of production starts to depress final product prices, then higher production may cause decreasing returns to scale in value creation.

Table 12.1 presents VGRs for the largest 1000 industrial firms in Turkey, a middle-income country that can be considered to be in Stage II. Clearly, the VGRs vary significantly across sectors. VGRs are relatively low in sectors such as paper products, food products, and beverages and relatively higher in oil refining, computer and electronics products, and transport equipment (Table 12.2).

The potential market size of the product/sector is also important as a source of value generation; if the overall domestic or international market potential is too small for a product/sector, even high VGRs might not warrant strategic importance. The market potential for a product/sector i (MP_i) is a function of not only the current market size but also its future trends. Consequently, a simple formulation for a product's (or sector's) potential of value generation can look like the following:

$$\mathrm{EVAP}_i = \mathrm{VGR}_i \times \mathrm{MP}_i$$

Table 12.1 Value generation rates in large Turkish industrial companies[a]

Sector[b]	*Median VGR (%)*[c]	*Number of firms*[d]
Mining of coal and lignite	35.3	2/4
Extraction of crude petroleum and natural gas	39.4	1/1
Mining of metal ores	67.3	8/10
Other mining and quarrying	29.4	2/6
Manufacture of food products	12.0	110/208
Manufacture of beverages	20.0	7/12
Manufacture of tobacco products	712.4	1/4
Manufacture of textiles	25.2	62/114
Manufacture of wearing apparel	21.9	14/38
Manufacture of leather and related products	21.1	2/2
Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials	24.9	6/12
Manufacture of paper and paper products	18.5	8/31
Printing and reproduction of recorded media	32.3	4/9
Manufacture of coke and refined petroleum products	34.1	5/10
Manufacture of chemicals and chemical products	19.5	29/60
Manufacture of basic pharmaceutical products and pharmaceutical preparations	32.3	6/14
Manufacture of rubber and plastic products	19.6	20/42
Manufacture of other non-metallic mineral products	35.5	38/76
Manufacture of basic metals	15.7	52/111
Manufacture of fabricated metal products, except machinery and equipment	23.5	14/33
Manufacture of computer, electronic, and optical products	32.2	6/7
Manufacture of electrical equipment	28.0	20/55
Manufacture of machinery and equipment	28.4	13/23
Manufacture of motor vehicles, trailers, and semi-trailers	27.9	32/67
Manufacture of other transport equipment	46.8	3/10
Manufacture of furniture	27.1	7/12
Other manufacturing	3.8	6/9
Electricity, gas, steam, and air conditioning supply	15.5	8/20

Notes: [a]The data relate to largest 1000 industrial companies in Turkey
[b]Nace Revision 2 classification
[c]Median value of the ratio of value-added 2. Total net sales for each firm in the sector
[d]The first number is the number of firms with data. Second number is the total number of firms in the sector

Source: Istanbul Chamber of Industry (2015a, b) and author's calculations

Table 12.2 Backward linkages of two selected manufacturing industry subsectors

Manufacturing industry subsectors	*Beverage bottling plant*	*Shipyard*
Sub-sectors of backward linkages	Glass manufacturing firms	Iron and steel firms
	Sweetener and dye firms	Casting and Forging
		Electronics, electronic equipment and IT firms
		Glass manufacturing firms
		Various mechanical equipment firms
		Power generation equipment firms
		Engine manufacturers
		Composite material manufacturers
		Petrochemical firms
		Propeller manufacturers
		Internal furniture firms

Altogether, VGRs for the sector/product and its market potential in the country as well as export markets can be used to assign indices (from 0 to 100). One way can be to normalize the highest sector/product EVAP to 100 and to assign pro-rata indices to others.

Learning Depth (Potential): The Firm as a Repository of Knowledge, Skills, and Institutional Capacity

Investment cost of starting a competitive private firm that can develop, manufacture, and sell automobiles is quite high and such an endeavour would have a relatively low probability of success. The high cost of that initiative, properly adjusted by the low probability of success, is a measure of the value of an up-and-running automotive firm.

LbD leads to the development of technical and managerial skills in the firm. A successful private automobile manufacturer, for example, encompasses the value of all the competitive skills cumulatively built over time, including the phase of investment; it is thus a repository of significant skills built over years of manufacturing operations. These skills are embedded in the firm as an intangible asset. It is manifested by diminishing unit costs as cumulative production increases.

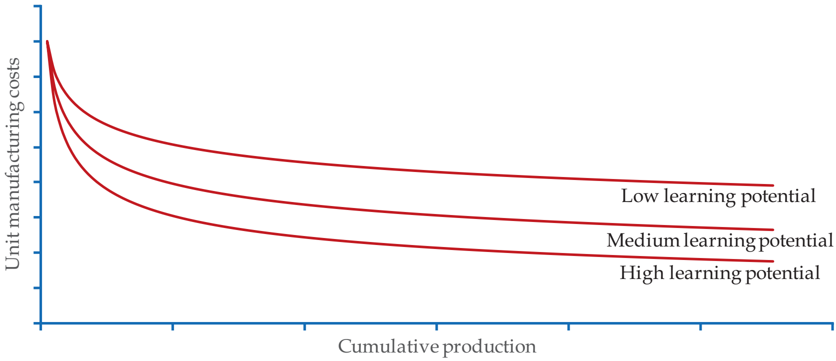

Fig. 12.4 Learning curves for three hypothetical sectors/products

In practice, the LbD process is based on the elasticity of unit production costs (in terms of labour hours) relative to cumulative production. Typical functional form (Fig. 12.4) for the learning curves is modelled as $c_N = aN^b$, where a represents the production costs (labour hours) of the first product, c represents the production cost of the Nth unit, and consequently N represents cumulative number production (=N). The progression rate $b < 0$ represents the extent of reduction in unit costs in response to the increase in cumulative production; it is calculated as $b = \log(L)/\log(2)$, where the learning rate ($0 < L < 1$) equals 1 minus the improvement rate. The improvement rate that emanates from the learning process is defined as the reduction in the unit production cost as the cumulative production is doubled. Thus, the learning rate, the principal metric of the learning potential, is converted into the asymptotically continuous rate of improvement in production costs.

Learning depth can be defined as a combination of the extent of possible cost gains and/or the time required to reach it. These two factors, determined by the parameter b in the above equation, determine the exact shape of the curves in Fig. 12.4. The rate of accumulation of skills from LbD, b, by the representative firm may differ from sector to sector (or product to product); some sectors (or products) offer steeper progress curves. The potential for the fall in unit costs and its speed determines the 'learning depth' or 'learning potential' of the sector. For example, the learning rate is likely to be higher in aircraft manufacturing compared to bottling. In other words, not all sectors (or products) are equal in terms of the 'learning potential' and thus a higher potential for the accumulation of intangible assets or value that the firms may capture by entering the market and continuing to manufacture.

A sector or product with a higher 'learning potential' offers a higher potential for accumulation of intangible value and assets stored by the corporate sector of the country (Fig. 12.4). Industrial policies inducing firms to enter or increase production in such sector/products may yield both higher social welfare and competitiveness at the firm level.

There are many studies that have empirically estimated the learning curves for different sectors. These estimates or new ones can be used to assign an index of learning potential (ranging from 0 to 100 in this study) to different sectors/products.

Technological Depth

Technological depth of a product or sector captures its potential to give birth to the creation of new or more developed products and processes. With reference to a sector or product, technological depth is the probability of creation of new products, processes, and technical knowledge for the incumbents from that time on. Technological depth relates also to technological 'linkages' or externalities. For example, the imaging technology may have uses in military products, mobile phones, TV sets, or computers.

It is clear that in terms of technologies involved there is a significant gap between the electronics industry and, say, the paper industry. The technological depth offered by the electronics sector has yielded many new products during the last several decades: the digital camera, the iPod and the tablet, the cellular phone, personal computers, and so on. Clearly, the electronics industry offers a higher potential of technological learning than the paper industry. In turn, in Japan and other East Asian countries, a deliberate decision by the private firms and the public sector to concentrate on the electronics sector has positively impacted on the economy.

It is not straightforward to fix numerical values to the technological depth of a sector or product. A qualitative scoring approach can best be used to assign technological depth indices.

Linkages

Backward linkages of a firm (or sector) constitute a cluster of firms (or sectors) that will be mobilized if the firm (or sector) is to increase its production. Thus, the overall economic impact of a firm's activities in terms of value added is multiplied by the amount of its domestic backward linkages. The manufacturing sector possesses a higher density of backward linkages than the primary or tertiary sector. However, even within the manufacturing sector, the level of linkages varies along different subsectors. As an extreme example, the shipbuilding sector has much wider backward linkages than a soda bottling plant (Table 12.2). The latter turns a liquid obtained from a well into soda, whereas the former turns a wide range of materials and equipment into a complexly designed final product.

The intensity of backward and forward linkages of a sector/product determines its total economic impact. An increase in the production of a sector with more intense linkages generates wider economic benefits across the economy. Leontief (1941) developed the concept of an input-output model which links sectors and subsectors within an economy with each other. An exogenous increase in the final demand of a product translates into economy-wide direct, indirect (primary and secondary), and induced economic impacts. These impacts can be estimated by multipliers obtained from the input-output tables.

The stronger the backward linkages of a subsector/product is, the higher is its multiplier effects. As mentioned in Chap. 5, that means its 'social return' (economic return to the entire society) is higher than its private return (profit to the firm or the subsector). That is because such products trigger production in many other sectors. A good example is automobile production, as mentioned in Chap. 5. Another one is the construction sector; a construction boom generates production and sales of many products such as cement, iron bars, glass, wood and furniture, cables, aluminium profiles, floor materials, and so on.

From a policy perspective this implies that it is more worthwhile for the government to support those subsectors. However, manufacturing subsectors differ in the levels of learning and technological depth—and thus in the levels of positive spillovers on the economy. Targeting two subsectors (such as automobiles and construction) with the same depth of linkages may have different economic impacts in the short run. In Fig. 12.5, the upper-right quadrant represents desirable subsectors that have maximal positive impact in both the short and long term. Some subsectors, such as aviation, can have extensive linkages and thus can contribute as a source of significant positive externalities, with only limited short-term macroeconomic effects. In the short run, the government is interested in macroeconomic performance such as growth or export earnings. In the long run however, it should focus more on developmental impact such as productive and technological capabilities.

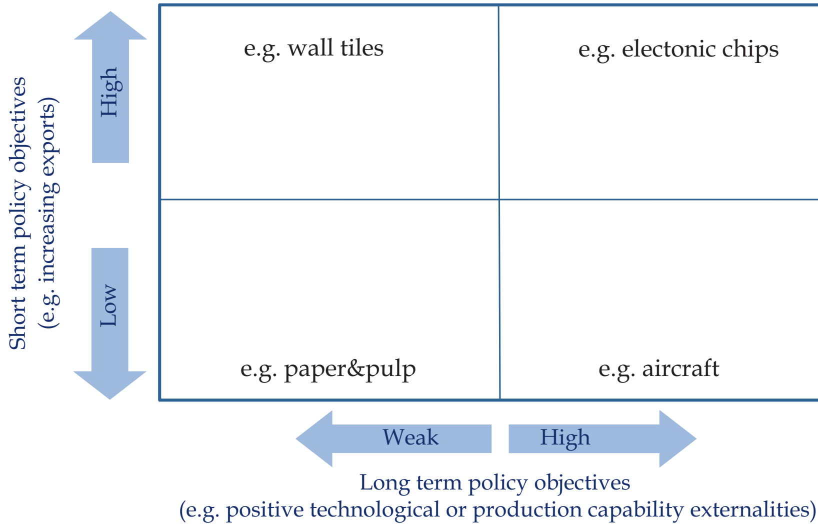

Fig. 12.5 Short- and long-term economic impact of sectors

Quantitatively, two short-run output multipliers can be calculated from Leontief's input-output table. A change in final demand (direct impact) for a sector's output multiplied by that sector's type I (respectively type II) output multiplier will generate an estimate of direct and indirect (respectively direct + indirect + induced) impacts throughout the economy.[15] Thus, a good analytical measure of the linkages of the sector is its output multiplier. It can be normalized with reference to the sector with the highest output multiplier to yield an index between 0 and 100. The long-run impact of linkages of a subsector should be incorporated through the indices measuring learning and technological potentials.

12.4 Sequencing Industrial and STI Policies

Another key question is how to sequence industrial policies and the STI policies? Should they be implemented concurrently or subsequently? Or, which one should precede the other?

The border between STI policies and industrial policies is not clear. STI policies include policies to support basic science, technology (which are 'horizontal' policies), and innovation (which is mostly in the form of governmental financial support or mentoring arrangements) to entrepreneurs (mostly new ones) and firms with a new idea or project. Types of general industrial policies may coincide a lot with technological or innovational policies. On the other hand, (horizontally) targeting technologies overlap with sector or product targeting. For example, supporting imaging technologies overlap with supporting electronics companies.

For the TCs at the national level (i.e. at the public and private sectors) to flourish, development of an industrial layer is a prerequisite. In other words, a certain amount of capacity building in the industrial sector will increase efficiency and effectiveness of STI policies; STI policies applied in an economy without a strong industrial layer are likely to be ineffective and cost-inefficient. This is because in the non-manufacturing sectors innovation effort is less productive compared to manufacturing sectors.

On an anecdotal basis, in many cases in the unindustrialized countries, the STI funds are wasted. The new products or processes may be developed as a result of these supports; but in many cases, they are not commercialized due to the fact that the country does not possess a strong industrial layer. Or, again due to the fact that the country lacks a strong industrial layer, the products or processes that are developed and commercialized may be just unimportant products that may not provide sufficient economies to the firm and country.

So, before a sufficiently strong industrial layer is formed in the country (or the region), the industrial policy should precede the STI policies (Fig. 12.6). In the earlier stages of industrial development, industrial

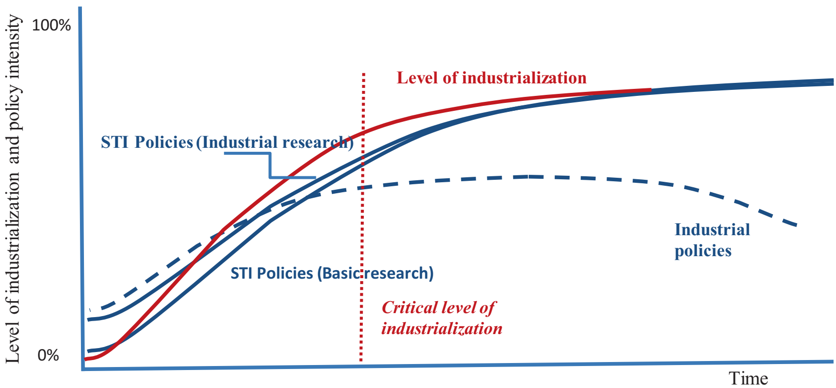

Fig. 12.6 Sequencing industrial and STI policies. (Source: Yülek (2016))

policies constitute the appropriate policy response, whereas in later stages, STI policies with an emphasis on industrial research should take over, subsequently shifting to STI policies with emphasis on basic research.[16]

12.5 Development-Based Public Procurement

Public procurement is potentially a very powerful industrial policy tool that can be instrumental in removing a key non-economic obstacle to different types of manufacturing firms: inadequate market access.[17] Low market access is probably the most important impediment to industrialization of developing countries.

Market access is also a critical survival factor for manufacturing companies, especially for younger and smaller ones with no prior reputation in the market, little financial means and collateral even if they have unique innovative skills. Manufacturing companies face inherent impediments to growth, especially in the developing countries. These include small domestic markets, inability to access export markets, low production scale, and low TCs. In addition, they face further impediments such as limited previous references from clients, inadequate branding and reputation, and even a psychological tendency of the local administrations (and consumers) towards well-known international products independent of their quality advantage, if any, over local products. All these and other factors exacerbate the market access difficulties for local manufacturing companies in developing countries.

Public procurement policies that are designed to alleviate these difficulties are called development-based public procurement (DbPP).[18] DbPP policies may be instrumental in raising the competitiveness of manufacturing companies and their technical capabilities, in assisting the development of small- and medium-sized enterprises (SMEs), and in complementing the existing STI policies. In addition, DbPP triggers secondary economic benefits accruing to the society: the observance of basic principles of public procurement of fairness, equity, transparency, competitiveness, and cost-effectiveness.[19] Thus, in the wider context of the linkages between industrial policy and economic development, DbPP may play a crucial role.

In many countries, governments grant financial support to firms under their STI policies to cover the areas such as R&D and innovation. Such financial support can be considered as 'indirect,' whereas the DbPP policies can be classified as 'direct' support to businesses. This is because market opportunity is a direct driver of industrial capacity building; seeing the market opportunities, the firm will leverage resources to manufacture and deliver products triggering learning, and other processes increasing the technical capabilities. In the process, the firm may use the financial (STI) supports, which are indirect, as enablers.

The types of secondary benefits as well as the extent to which they can be derived from better public procurement policies may differ in developed and developing economies. The developed economies possess sophisticated industrial structures and TCs, and their economic growth is driven by the growth of TFP rather than factor accumulation. In these countries, public procurement could be primarily used to support innovation for maximal benefit. The *procurement for innovation* initiatives in the UK is an example of that.

In developing countries economic growth is driven primarily by factor accumulation, and industrial and technological capacity is constrained by various obstacles. In these countries, DbPP policies could help strengthen basic industrial and technological capabilities, thereby enhancing the competitiveness of existing industries.[20]

There are well-known tools of DbPP. In the military field, countertrade or offsets are used widely to build manufacturing capacity. In the civilian field, local content rules have been commonly used such as those in South Africa.[21] In some countries such as the USA, India, and South Korea, 'set asides' from the procurement budget is utilized to provide procurement support to SMEs. Forward procurement or planned procurement is a technique to alert businesses to make preparations for future procurement plans.[22] In developed economies, procurement for innovation whereby the government demands a product to be developed and manufactured as it does not exist in the market is becoming a widely debated topic.

The list of these tools can be extended. For example, 'locality rules' can be used as a tool of industrial as well as regional development policy.[23] These rules basically specify that the procured product should be manufactured in an economically backward region that the government intends to develop. In many countries, the government extends financial incentives (such as tax holidays or exemption from employee income taxes) to private industrial investments in less developed regions. Introduction of 'direct' procurement incentives by locality rules of DbPP policies can complement those financial incentives in enhancing industrial investments in backward regions.

Notes

1. Mosconi (2006, 2015a, b).
2. Lucas (1993).
3. Pritchett (2000).
4. Aiyar et al. (2013).
5. Yeldan et al. (2012).
6. Eichengreen et al. (2012, 2013), Aiyar et al. (2013).
7. Yilmaz and Saracoglu (2016), Lee and Narjoko (2015).
8. Such as Amsden (1992), Johnson (1982), Westphal (1990).
9. Weiss (2015).
10. Various studies have examined the de-industrialization process such as Nickell et al. (2008), Lawrence and Edwards (2013), and Peneder and Streicher (2018). Dasgupta and Singh (2006) minted the term premature de-industrialization and Rodrik (2015) discussed it further.
11. Papanek (1962).
12. It can be said that there is one main line of criticism against the sectoral industrial policies: How can the government 'select a sector' better than the firms? Then, this line of criticism sets out to argue that general inefficiencies and failures of government action would extend to industrial policy.
13. Over time, the 'strategic' sectors also changed. For example, textiles, which was a targeted sector in Japan in late nineteenth and early twentieth centuries, lost its importance and share in GDP and exports against steel, automobiles, electronics, and so on.
14. Libicki (1989).
15. D'Hernoncourt et al. (2011).
16. Yülek (2016).
17. Yülek and Taylor (2012).
18. Yülek and Tiryakioğlu (2014).
19. Watermeyer (2012).
20. Yülek and Tiryakioğlu (2014).
21. Haines (2012).
22. Yülek and Taylor (2012), Yülek and Tiryakioğlu (2014), Haines (2012).
23. Yülek and Tiryakioğlu (2014).

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CHAPTER 13

Industrial Policy: Some Case Studies from Today's World

If industrial policy has a potential, it has to be demonstrated by some successful experiences. This section presents such examples as best practices. Successful experiences are naturally concentrated in a small number of countries in East Asia and Europe.

13.1 The Nuclear Power Programme: How South Korea Developed Its Indigenous Capabilities in Nuclear Power Generation and Converted It into an Export Industry

South Korea's nuclear programme was kicked off in 1956 with two objectives. The first objective was a simple one encountered in many countries: introducing atomic energy as an energy source in a country which still needs to import over 95% of its energy. But the second objective was unique to South Korea: to localize foreign technology in order to develop local technological and manufacturing capabilities and to ultimately form an export-oriented nuclear energy sector.

South Korea succeeded in not only the first but also the second objective. It firmly placed nuclear energy in its power generation; by 2016 South Korea was ranked as the world's number 6 in terms of nuclear energy generation capacity of 22.5 GWe from 24 nuclear plants. This capacity represented 36% of the country's total installed energy generation capacity. The country targeted raising that share to above

M. A. Yülek, *How Nations Succeed*,
https://doi.org/10.1007/978-981-13-0568-9_13

60% by 2030. In terms of nuclear plants' availability factor (93%) and capacity factor (91%) between 2001 and 2006, South Korea ranked top in the world.[1]

In terms of the second objective; from nowhere, in five decades, South Korea became one of the very few countries which not only designed and built its own nuclear power plants and manufactured plant equipment but also exported them. In 2009, a South Korean consortium (led by the government-owned Korea Electric Power Corporation and including KOPEC, Hyundai Engineering and Construction, Samsung, and Doosan Heavy Industries, along with two subcontractors from the USA and Japan) won a $20 billion contract for the design and construction of a nuclear power generation facility in the United Arab Emirates (UAE). The contract was considered one of the largest globally and the South Korean consortium beat big and established groups—a French (Areva, Total, and GDF Suez) and a Japanese-US (General Electric and Hitachi) consortium.

So, how did a small country manage to develop an internationally competitive and export-oriented industrial layer in a high-technology area? The answer in short, which is detailed in the remainder of this chapter, is meticulous design and implementation of an industrial policy including the following important aspects:

- Leveraging public procurement decisions involving acquisition of new products or services from state or privately owned domestic companies—rather than importing—and developing the latter's technical capabilities,
- enabling domestic companies and institutions to benefit from LbD through public procurement,
- training manpower in the public research agencies over the years and letting these centres absorb and then improve upon foreign-sourced technology, and
- forcing and coordinating technology transfer from public research agencies and foreign firms to domestic companies.

The process consisted of four stages (Table 13.1), as explained in the remainder of this chapter.

Stage I: The Beginning: Introduction of Nuclear Energy Research and Building Up Manpower and Infrastructure (1956–mid-1960s)

South Korea set out to develop nuclear energy plants and localize its technology in 1956. Before that year, it did not possess any technological knowledge or educated manpower in the field. In 1957 the country became a member of the International Atomic Energy Commission.

During the first stage, South Korean authorities made the necessary decisions and set first targets (i) to start educating nuclear experts, (ii) to enact a dedicated law, and (iii) to start early nuclear research in agriculture and medicine. Between 1956 and 1964, 240 students were trained in the field of nuclear technology. They later played key roles in the development of nuclear technology in the country. After joining the International Atomic Energy Agency (IAEA) in 1957 a law was enacted to build the sector and to establish important bodies, forming the institutional basis for nuclear energy research.[2]

The Atomic Energy Agency (AEA) was established to take charge of the atomic energy development task. The Korean Atomic Energy Research Institute (KAERI, 1959) was formed to carry out research on nuclear energy and equipment, and the Korea Atomic Energy Commission (KAEC) was established to advise on policy, budget, and regulation related to atomic energy. KAERI later became Korea's main actor tasked to learn advanced nuclear power technologies. Its activities were initially restricted to the application of radiation and radioisotopes for agricultural and medical purposes.

Research was not initiated until 1962 with the introduction of TRIGA Mark-II, a 100 KWe research reactor (later increased to 250 KWe) designed and built by American firms General Atomics and General Dynamics. This reactor assisted in the first studies of nuclear power and served until 1995.

Stage II: Introduction of Turnkey Power Plants (mid-1960s–mid-1970s)

In the mid-1960s, with the start of Korean industrialization, the need for energy became more obvious in a country with a very poor endowment of energy and natural resources. In 1968, the government drew up a master plan that authorized the national utility firm, Korea Electric Power Corporation (KEPCO), to construct two nuclear power plants. The decision

Table 13.1 How South Korea localized nuclear energy technology

	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
Stage I. The beginning																																
Some main institutions established																																
TRIGA Mark II research reactor acquired from the USA																																
Training of manpower in the public research agencies																																
Stage II. Turnkey nuclear plants																																
Feasibility studies and authorization of KEPCO to build to nuclear power plants																																
Training of personnel																																
Stage III. Localization of engineering services and equipment																																
KABAR (KOPEC) established																																
MLP																																
KOPEC's design capabilities enhanced																																
KAERI's program of localization starts																																
Local firms acquiring capabilities																																
KHIC established and and starts manufacturing parts for plants																																
KAERI's program of localization starts																																

1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017

(*continued*)

Table 13.1 (continued)

	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
Training of personnel																																
Stage IV. Learning-by-doing: Furthering the localization by the acquisition of core technologies																																
Promotion Law of Technical and Engineering Services amended																																
Master Plan for Technological Localization of Nuclear Plants																																
Korean firms selected as prime contractors for the first time (10th and 11th plants)																																
Selection of Sargent and Lundy to provide technology transfer to KOPEC in basic design																																
KOPEC acquires basic design know how and skills																																
KAERI starts receiving NSSS technology transfer from Combustion Engineering Inc. basic design know how and skills																																
KNSP and KNSP+ developed																																
Stage V. Learning by Exporting (2009 onwards)																																
Rebranding KNSP and KNSP+ as OPR-1000																																
Signing of first export contract (UAE)																																
Completion of first of four units in UAE																																

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was based on a feasibility study compiled by foreign consulting firms and IAEA. KEPCO was to subsequently play a very important role in developing the local nuclear energy and converting it into an export industry.

KAERI's previously trained nuclear scientists and engineers made a comparative study of the then available nuclear generation technologies (pressurized water reactor, PWR; boiling water reactor, BWR; and advanced gas reactor, AGR) and concluded that PWR and BWR were superior to AGR in terms of safety, reliability, and large-scale operation.

The bidding was made one turnkey basis, as Korea possessed no experience and capabilities to design and construct nuclear plants. The participating companies were from the USA and the UK—Combustion Engineering (PWR), Westinghouse (PWR), General Electric (BWR), and British Nuclear Export Executive (AGR). Although the latter proposed a better offer for commercial loans, KEPCO selected Westinghouse based on KAERI's study.

The first plant (Kori 1) was successfully completed in 1978 and the second one (Kori 2) was delayed due to financing problems, thus completing in 1983. A third plant (Wolsong 1), also on a turnkey basis, was commissioned to Atomic Energy Canada Ltd and was completed also in 1983.

During this turnkey stage, nuclear personnel were nevertheless educated and they acquired operational skills with the objective of making Korea self-sufficient in operating nuclear power plants. This included overseas training of operators and engineers for quality control and preoperational testing. Meanwhile, KAERI sharpened its capacity in reviewing technical proposals and the preparation of contract agreements.

Stage III: Localization of Engineering Services and Equipment (mid-1970s–1985)

In the 1970s, as the construction of the first plant proceeded, localization measures began to be carried out. In 1975, the government established, for the first time, a joint venture nuclear energy engineering company *Korea Atomic Burns and Roe* (KABAR) with the British company Burn and Roe. The firm was to participate in the design of the second plant. However, Bechtel, the prime contractor (under Westinghouse), objected. KABAR could only supply manpower for simple work, denying the company the opportunity to build up any major expertise, and Burns and Roe withdrew from the partnership after only one year. Participation of other local firms was also very limited in the design and construction of the first three nuclear plants. For example, Hyundai only provided some construction material to the first plant, but it undertook a lot of site drawing and installation work on the second plant.

This did not deter the government from further attempts. In the 1970s, the Korean government undertook large physical investments under the Heavy and Chemical Industries (HCI) Drive. In order to leverage this to develop local technological capabilities, in 1976, it introduced the Machinery Localization Policy (MLP) aimed at increasing the local content ratio of plants and equipment instead of having new turnkey plants built by foreign firms. In line with the MLP, KEPCO adopted a non-turnkey approach so that local firms could participate in the development and construction of nuclear plants. This led to a significant build-up of domestic capabilities in nuclear technologies.

Engineering Capabilities

In the engineering field, Bechtel had to accept a technology transfer clause in the contract for the 4th and 5th plants. Under that clause, 28 engineers of KOPEC, the successor to KABAR, were trained by Bechtel and participated in the detailed design process. That enabled KOPEC engineers to build up the detailed design capabilities between 1981 and 1985. More KOPEC engineers were trained subsequently and participated in the design of the 6th and 7th plants. This initiated an LbD process, which helped the engineers master their skills and confidence in designing nuclear plants; knowhow was transferred to the organization level.[3] The participation ratio of domestic manpower increased from 16% for the 3rd nuclear plant (1983) to 46% for the 8th and 9th nuclear plants completed by 1990.[4]

Manufacturing Capabilities

Under the MLP, KEPCO identified possible equipment that could be locally manufactured for the 4th and 5th plants. This equipment was procured from domestic manufacturers, helping them to develop their technological and productive capabilities. In 1978, KAERI launched a project in which it selected certain items and collected and analysed the related technical documents. Local firms then assimilated the knowhow of the foreign equipment through reverse engineering.

In 1980, "in order to acquire and localize the foreign technology intensively within the shortest possible time,"[5] Korea Heavy Industry and Construction company (KHIC), a government-owned manufacturing firm, was granted monopoly rights to manufacture power generation equipment and to participate as a subcontractor of a foreign supplier for the 6th and 7th nuclear projects. KHIC participated in welding and assembling some minor equipment such as heat exchangers and refuelling equipment in the 6th and 7th nuclear projects. For the 8th and 9th nuclear projects, it participated in assembling the major equipment—reactor vessel, steam generator, and pressuring equipment—by introducing the imported half-finished products. At that time, KHIC lacked the prior knowledge base related to equipment manufacturing, so it could assimilate only the assembly capacity. Meanwhile, the local content ratio of equipments increased from 13% for the 2nd nuclear plant to 40% for the 8th and 9th nuclear plants in terms of total cost of plant to Korea.

Stage IV: Learning by Doing: Furthering the Localization by the Acquisition of Core Technologies (1985–2009)

In 1985, the Korean government introduced a milestone policy, the Master Plan for Technological Localization of Nuclear Power Plants (MPTL). The MPTL allocated the roles and duties among government-owned firms (mostly KEPCO subsidiaries) and research institutions in order to develop the nuclear power industry[6]:

- KHNP: total project management[7]
- KOPEC[8]: architectural engineering (AE) and nuclear steam supply system (NSSS) design
- KAERI: R&D
- KPS: maintenance services[9]
- KHIC (later Doosan): turbine and generator manufacturing[10]
- KNFC: nuclear fuel design and fabrication[11]

All this effort brought South Korea to a completely new stage in 1987 when Korean firms and institutions were selected as prime contractors and equipment suppliers for the 10th and 11th nuclear plants. The new objective was to standardize the design of nuclear plants and offer domestic players an LbD opportunity. This was made possible by the procurement power of KEPCO, which was the sole decision maker on procuring the plants. Local firms asked foreign firms to transfer their core technology. This was achieved as the domestic firms and research institutions already had a strong base of well-trained manpower and capabilities; foreign firms had to accept partly because the international market was stagnant. The same domestic actors acted as the prime contractors of the 12th, 13th, 17th, and 18th plants, reinforcing their capabilities. The country's 5th long-term power development plan in the year 2000 foresaw the construction of nine more plants.

In 1994, the Long-term Nuclear Power Promotion Program (LNPP) was launched to cover the period up to 2030. Key objectives of the programme were to ensure self-sufficiency in nuclear power generation and fuel cycle technologies, and to convert nuclear technology into an export industry. In 1995, the Atomic Energy Act was amended and Comprehensive Nuclear Energy Promotion Plan (CNEPP) was introduced. The CNEPP was to be prepared and revised every five years to set long-term nuclear policy objectives and basic directions through sector-based targets and implementation plans.

Coordination of the Localization Process

KEPCO, as the national utility company, was at the helm of not only the process of construction of the 10th and 11th plants but also achieving the localization process of core technology and developing the capabilities of the domestic firms. It supervised and coordinated the process through regular progress reports and meetings. It also bore the responsibility for providing the financing needed by the domestic companies for localization.

In order to accelerate the development of the local engineering firms, in 1981 the government had amended the Promotion Law of Technical Engineering Services. The amendment required that a local engineering services firm be the prime contractor for any engineering services demanded by domestic firms (government approval was needed if a foreign firm had to be the prime contractor for any reason). This was import substitution at its zenith in a sector that no other country had done before. In the nuclear energy area, it was reflected by the introduction in the MPTL, which stipulated that domestic firms should be the prime contractors in the succeeding projects.

The MPTL's clear objective was to develop local capability of designing and constructing nuclear power plants with the specific target of increasing the "technological level from about 60% of foreign technology to up to 95% by 1995" (Table 13.2).[12] This required transfer of international technology, training of manpower, increasing indigenous R&D activities, and LbD (consisting of design drawings, simulated design drawing, manufacturing of prototypes), joint work, consulting, or diagnostic services. A body (Electric Power Group Corporation Council, EPGCC) was established by KEPCO in order to coordinate the localization process under the plan. It was composed of the representatives of firms and research institutes.

Table 13.2 Nuclear technology localization in Plants 10 and 11 (1986–1995)

	Localization (%)		
	Share in total cost (%)	*Status in 1986*	*Target for 1995 (%)*
Project management	15	85	98
Architecture engineering	21	60	95
NSSS design	7	30	95
NSSS equipment	24	40	87
Turbine/generator	11	54	98
Nuclear fuel design and manufacturing	5	5	100
Erection/installation	17	95	100
Total	100	369	673

Source: Sung and Hong (1999)

Detailed Design Capabilities

The 10-year National Medium-and-Long-term Nuclear R&D Programme was launched in 1992. The programme was funded by both the government and the nuclear industry.[13] During the construction of 10th and 11th plants, KOPEC acquired the basic design technological capabilities and acted as the prime contractor for design. Previous to the 10th and 11th plants, KOPEC's engineers had acquired some experience and capabilities related to AE. For the 10th and 11th plants, a foreign company (Sargent and Lundy) was selected in 1987 to train KOPEC engineers in basic and detailed design and to transfer knowledge and technology to KOPEC. These engineers designed the new plants together with the Sargent and Lundy (S and L) engineers. KOPEC developed a management system of AE, which was combined with S and L's software, and Bechtel's work procedures.

KAERI was assigned the task of acquiring the capabilities necessary to design the NSSS. NSSS is the core of the nuclear plant and design drawings are used as the technical specification for equipment manufacturing, equipment procurement, and AE works. This required the development of further indigenous R&D efforts. KAERI received technology transfer and (theoretical and practical) training from Combustion Engineering Inc. (CE), an American company, covering technical specification, design drawing, and design software and coding system. KAERI and CE engineers then undertook the NSSS design of the two plants. KAERI's acquisition of these capabilities constituted more than half of total KEPCO R&D expenditures for the plants (Table 13.3).

Furthering the Capabilities

By the 10th plant, a significant amount of localization was achieved. As the same domestic actors acted as the prime contractors for the 12th, 13th, and then 17th and 18th plants, their capabilities were further enhanced. In the 14th and 15th plants, Atomic Energy Canada Ltd acted as the prime contractor for the 14th and 15th plants, which were designed as the Korean Standard Nuclear Power Plant (KSNPP) based on particular conditions of Korea. KSNPP formed the basis of the 17th and 18th plants with improvements introduced (KSNPP+). Korean engineers also designed the associated equipment, while only a critical process was designed by consulting foreign experts.

Stage V: Learning by Exporting (2009 Onwards)

Efforts to export reactors began in the early 2000s. In 2005, indigenous KSNPP and KSNPP+ reactors were later rebranded as Optimised Power Reactor "OPR-1000" for export markets, particularly for export markets in Asia, in particular Indonesia and Vietnam. In 2003 Korea completed the indigenous design of the 1400 MWe Advanced Power Reactor (APR1400) and received safety certificate from the Korean Institute of Nuclear Safety. APR1400 was developed over KNSPP and KNSPP+. The first APR1400 was connected to the Korean grid in 2016. Two more were planned to be completed in 2017 and 2018.

In 2007, KHNP did not renew its reactor licence agreement with Westinghouse; instead it entered upon an agreement to jointly market reactors, while replacing licenced components with the components which it designed.[14] KHNP thus aimed at benefiting from Westinghouse's reputation, while reducing its dependence on licenced components. KHNP then kicked off a $200 million programme to develop an exportable advanced APR+ large reactor design by 2015.[15]

In 2009, South Korea entered the fourth phase, by winning its first international client in nuclear reactors. It was a $20 billion contract in the UAE to build four APR1400 plants. In 2010, it announced its target to export 80 plants by 2030, seeking markets in countries such as India, Vietnam, Poland, Saudi Arabia, and South Africa.[16] In the same year, the

Table 13.3 Korea's localization of the nuclear power plant technology

	Plant 1	*Plant 2*	*Plant 3*	*Plant 4, 5*	*Plant 6, 7*	*Plant 8, 9*	*Plant 10*
Construction period	1970–1978	1976–1983	1975–1983	1978–1986	1979–1987	1981–1990	1987–1996
Architecture engineering[a]	NA	NA	16%	37%	44%	46%	75%
Equipment[b]	8%	13%	14%	29%	35%	40%	74%
Nuclear steam supply system	0	0	0	10%	18%	26%	64%
Turbines and generators	0	0	0	11%	28%	45%	72%

Source: Sung and Hong (1999)

Notes: [a]Participation of local architecture and engineering manpower (in man-hour terms)
[b]In terms of cost of locally supplied equipment in total

Korea Atomic Agency and Daewoo won a small ($130 million) contract in Jordan to prepare a feasibility and environmental impact study, to build a research reactor and supply fuel. The reactor was completed in 2010. Korea provided a soft loan to partly finance the project.[17] KOPEC is developing an APR1400-EUR for the European market, starting with Finland.

Korea's winning consortium in the UAE project was led by KEPCO (Table 13.4). This was a unique case where a state-owned utility company, which then held 68GWe of production capacity and retained the monopoly of electricity transmission and distribution in Korea, led an international contract consortium. It had been built upon KEPCO's earlier efforts to raise the capabilities of local companies and also leveraged on the fact that it was a large, state-owned utility company. This shows the importance of public procurement power of KEPCO in building local capabilities and taking them to export markets. KEPCO now also enjoys nuclear engineering, maintenance, and nuclear fuel production capacity through its subsidiaries.

Further, the design of the consortium members showed great prowess. Korea's governmental power (including financial)[18] was coupled with Korean firms that now had capabilities in designing and building nuclear plants, and part of the pie was offered to well-known international partners (as subcontractors) to add additional credibility to the Korean con-

Table 13.4 Korean consortium in the UAE bid

Role	*Firm/institution (governmental/ private)*	*Subcontractors*
Consortium head	KEPCO (governmental)	
Consortium member (architecture)	KOPEC (governmental)	
Consortium member (construction)	Hyundai and Samsung (private)	
Consortium member (main equipment)	Doosan (private)	Westinghouse (USA)
Consortium member (turbine and generator)	Doosan (private)	Toshiba (Japan)
Consortium member (maintenance)	KEPCO Plant Service and Engineering Co (KPS; governmental)	
Consortium member (nuclear fuel)	KEPCO Nuclear Fuel Co (KNF; governmental)	Westinghouse (USA)

Source: Kane and Pomper (2013)

Table 13.5 Airbus: Airplane deliveries and order backlog (as of October 2017)

	A300/A310	*A320*	*A330/A340/A350*	*A380*	*Total*
Total orders	816	13,308	2929	317	17,370
Total deliveries	816	7820	1872	217	10,725
Backlog	0	5488	1057	100	6645
Aircraft in operation	331	7472	1744	217	9764

Source: www.airbus.com (Airbus corporate website)

sortium. The consortium members were made up of other publicly owned and private Korean firms and institutions. Particularly, two KEPCO subsidiaries groomed over the years (KNS and KFN) were part of the export consortium. Three major Korean groups were part of the consortium as well: Hyundai, Samsung, and Doosan. These all-Korean partners were to be assisted by American and Japanese subcontractors: Westinghouse and Toshiba (Table 13.5).

As the book was being authored, the first of the four plants was about to be put online in 2017 and the remaining three to be completed by 2020. As Korea's first major nuclear export item, these nuclear plants provide important experience and reference to Korea's nuclear plant capabilities. In the future there is no doubt that nuclear plants will be a major export good for Korea.

13.2 How South Korea Developed Its Indigenous Automotive Industry

In 1960, South Korea barely had automobiles, let alone any major automobile production. By the 2000s, South Korea became the fifth largest automobile manufacturing country in the world, accounting for 10% of the global output. This ascendance from scratch to top of class owed a lot to the government's industrial policies in addition to a successful performance by the country's industrial layer. Korean governments experimented with different policies, yielding mixed results initially. Ultimately, an indigenous and export-oriented automobile industry was established as targeted. How was this achieved? This section presents a brief account of the process.[19]

Stages of the Development of S. Korea's Indigenous Automobile Industry: The First Attempts (1960s)

Korean governments played a very important supporting role through industrial policies in the emergence of South Korea as one of the major automobile manufacturers in the world. These policies started during early 1960s. In fact, in the 1950s due to rising oil imports and severe shortage of foreign exchange, the government restricted the usage of automobiles.[20]

The military government that came to power in 1961 initiated a car assembly plant and expected the emergence of a Korean-made car within five years. Its most important aim was the development of local manufacturing (*kuksan-hwa*) of automobiles and parts. The "Five-Year Automobile Plan" targeted the production of the automobile with at least 95% local content. Imports of completely built vehicles and their parts and components were banned, as it was assumed that local assemblers could not survive without protection from international competition. However, capital goods and components for assembly could be imported tariff-free until they could be locally produced.

Despite the strong commitment and support from the government the Five-Year Plan was not successful; the only assembler that was licenced (Saenara) ceased operations in less than a year, with only 2773 units manufactured. There were rumours that there was a corrupt deal between the government and Saenara.

The next initiative was the Comprehensive Promotion Plan for the Automobile Industry in 1964. Its strategy was to have a monopolist assembler attain full-scale local content of all types of automobiles through 75 subcontracting manufacturers of 200 auto components. The subcontracting system was taken further in the Basic Promotion Plan, which aimed at attaining full-scale local content within three years. Nevertheless, this attempt also failed just like the first one due to small production scale, high production costs, and weak domestic demand.

Long-Term Automobile Industry Promotion Plan (1970s): Local Production and Export Starts

The Long-term Automobile Industry Promotion Plan of 1974 is considered as the most successful plan in the development of an indigenous automobile industry in Korea. The Plan was based on the domestic assemblers developing their own brands and technology rather than manufacture under foreign licences. At first, given the negative economic impact of rising oil prices, the government ordered domestic assemblers to develop fuel-efficient, small-sized cars with engine capacity less than 1500cc even though most of the cars at that time had much larger engines. The price level would be around $2000 to increase the domestic car usage and to be able to compete with foreign competitors.

There were three other important targets. The first was the target of 95% local content. The second was an annual production level for every model higher than 50,000. At the time, this was a low level according to the global norm, yet the local demand was no more than 10,000 in 1972. Finally, all the guidelines had to be met within two-and-a-half years. The government offered a compelling incentive as well the assembler satisfying all the requirements of the Long-Term Plan would be guaranteed a dominant market share—say, more than 80%.

At the time, Hyundai was the most determined Korean firm in its determination to stand on its own feet (by developing indigenous technology) and make a model which could be exported. The company initially relied on licences for technology, along with foreign designers and managers. For instance, in October 1974 Hyundai built a prototype car through a contract with Giugiaro and Ital Design of Italy. The company used engines, gearboxes, and rear axles designed and developed by Mitsubishi of Japan. In addition, in March 1974 George Turnbull, former managing director of the Austin-Morris division of British Leyland Motor Corporation, along with six other senior engineers, was employed to lead the construction of an integrated manufacturing plant. In the end, Hyundai succeeded in launching Pony, its own model in February 1976 (Fig. 13.1).

Both Hyundai and Kia immediately tapped export markets in addition to the local market with their first locally branded models. The USA was selected among the first markets to export to. Different corporate strategies resulted in different sales and exports performance. From 1976 to 1979, when each assembler's 'Korean type' model was on the market, Hyundai sold 115,955 units of the Pony, while Kia sold 48,861 units of the Brisa. General Motors sold 14,858 units of the Camina and Gemini, which were not locally designed.

Exports to the USA increased over time. Because of automobile trade conflicts between the USA and Japan from the late 1970s, a temporary niche market for subcompacts opened up in the USA. The US carmakers wanted to import cheap subcompacts from developing countries such as

Fig. 13.1 Pony: Hyundai's first car. (Photo credit: Murat Yülek; Seoul Museum of Industry)

Korea and Mexico until they could restore their own competitiveness. In addition, local carmakers benefited from competitiveness due to weak Korean won, cheap oil, and low interest rates.

1980s Onwards: The Global Player

In the 1980s, the sector evolved towards deregulation and maturation. Industrial policy in the automobile sector was gradually replaced by deregulation in the 1980s, which removed the import ban and entry regulations imposed in the early 1960s. After 1997, the bankruptcy of Kia, the second largest carmaker, during the Asian crisis destabilized domestic financial markets. The policy makers dramatically changed their attitude to active intervention. Moreover, the International Monetary Fund (IMF) encouraged structural restructuring as part of its pre-conditions for financial assistance after the 1997 Asian crisis. The government did not appear to have a master plan for sectoral reorganization. It believed that failed companies should be either liquidated or sold off rather than bailed out by the government. Kia was taken over by Hyundai and Daewoo by GM. Renault acquired majority stakes in a smaller manufacturer, Samsung.

By the 2010s, Korea became the sixth largest automobile manufacturing country of the world, accounting for 10% of global production in quantity. Korean firms were among the most technologically advanced in the world. All that was made possible by the industrial policies of the 1960s and 1970s.

13.3 Sweden's Industrial Policy in the Aviation Sector: Saab as a National Champion

"During the 100 years from 1870 to 1970, Sweden developed from one of the poorest countries in Europe to one of the richest and most advanced economies of the world."[21] Industrial policies in defence and aviation played a critical role in Sweden's economic and industrial development in the eighteenth and nineteenth centuries. Sweden continued to employ defence-related industrial policies to further its economic, industrial, and technological development even in the 1980s.[22] The objective was to develop local industrial and technological capabilities and to eliminate dependence on other nations (Fig. 13.2).

Several factors played important roles in Sweden's successful industrial development:

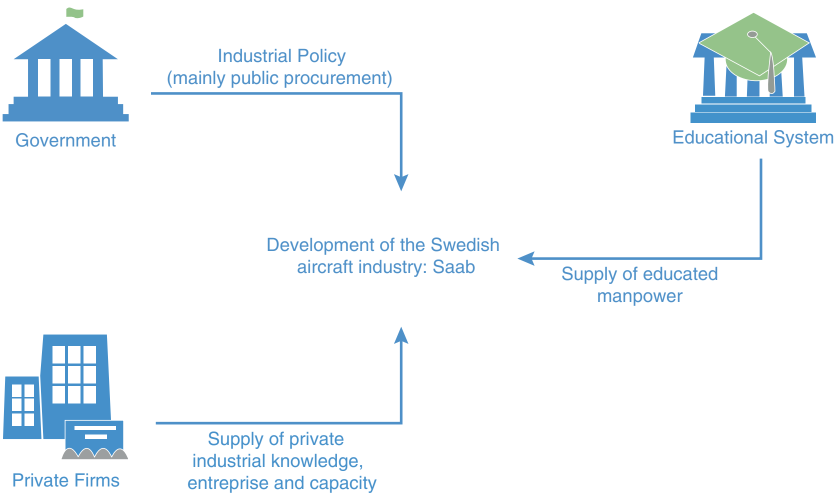

Fig. 13.2 The drivers of Sweden's aviation industry development

- Industrial policy based on defence and public procurement

  A demonstration of Swedish industrial policy, Svenska Aeroplan Aktiebolaget (Saab), a Swedish company, is one of today's most well-known civilian aircraft manufacturers in the world. It is an example of a national champion with roots dating back to the Swedish government's defence and industrial policy back in the 1930s. Industrial policy acted as some sort of a public-private-partnership framework whereby the government provided a de facto procurement guarantee for locally manufactured warplanes, with a view to developing the country's manufacturing capacity independent of non-Swedish suppliers of industrial goods and technology. The same strategy was repeated in the 1980s.[23]
- Education system: supply of engineers with entrepreneurial and practical experience

  The government played an important role also in providing an educational system which supplied good engineers, industrial workers, and managers. A balance of practical and theoretical aspects was the earmark of the successful Swedish educational system in providing workforce to the industry.
- Private sector: enthusiastic industrial firms and entrepreneurs

  Industrial entrepreneurship has also been an important determinant of Sweden's success. A number of industrial firms in defence, transportation, and related industries have been the driver of Sweden's industrial and thus economic ascendance. Many of these firms survived to our times as large internationalized Swedish firms. The education system has played a role in generating entrepreneurial engineers who created industrial start-ups which later became giant companies.
- Creation of institutional capacity

  The above important factors point out to a strong institutional structure in the public and private sector; good government and good firms enabled by a good educational system.

Reviewing the case of Saab below reveals these aspects and indicates that the main tenet of the Swedish industrial policy in the aviation sector in 1930s repeated itself in 1990s: top priority accorded to developing domestic industrial capacity.[24]

The Driving Force: Industrial Policy in the Defence Sector Spurring the Domestic Industrial Capacity in the Aviation Sector

As the Second World War clouded the horizons, security concerns in Sweden mounted. The Swedish Parliament decided in 1936 to strengthen the country's defences. That required a large proportion of the funding to be allocated to the Swedish Air Force, as it was now deemed critical for the country's military might. In particular, a total of 257 fighter and 80 trainer aircraft were ordered. These orders were the basis of a fledgling aviation industry in Sweden that later became one of the most successful in the world.

The Swedish government could have attempted to meet its demand for aircraft by importing from outside; from a budgetary point of view that was the attractive solution. However, the government's priority was to develop local industrial and technological capacity that would prevent dependence on suppliers from other countries. It is apparent that the decision makers of the time understood that technological independence was a prerequisite for sustained military capacity that could ensure the country's neutrality.

The same priority was upheld in 1980s when a decision had to be made whether to invest in developing a new-generation fighter airplane platform. Instead of purchasing foreign warplanes (or importing foreign platforms and developing upon them), Sweden's government preferred a seemingly much costlier alternative for its budget; Saab was to develop a brand-new warplane platform: the Gripen.[25] The project was successfully backed by the de facto procurement guarantee of the Swedish Air Force. The establishment of domestic production capabilities would reduce long-term budgetary impact (to lower-than-the-import values) and generate societal returns significantly higher than importing. Gripen later achieved exports also. Professor Gunnar Eliasson (2011) calculated that the project's overall economic return to the Swedish economy was 2.6 kronas for every krona spent by the Swedish treasury.

Founders of Saab: The Second Driver of Swedish Indigenous Aviation Industry

In Sweden, in the second part of the nineteenth century, engineering and manufacturing industries witnessed rapid development, although agriculture remained the prevalent economic activity. By the end of the nineteenth century, the share of manufacturing in the GDP reached that of agriculture, and manufacturing employment surpassed that of agriculture in 1930s. In the 1880s, several ground-breaking innovations were introduced and industrialization took off, driven by technological innovations and domestic capabilities. Between only 1880 and 1889 the number of industrial workers increased by a stunning 66%. This period also witnessed the establishment of today's important Swedish firms (such as Ericsson, Alfa Laval, ASEA, AGA, Nobel, and SKF). These firms were the flag bearers of Swedish industrialization. The development of institutions for science, technology, and education laid down the foundation for this kind of success. Flourishing educational institutions such as the Technological Institute in Stockholm (1826) and the Chalmers Technical School (1829), and Universities of Uppsala and Lund were established and helped in the industrialization process.[26]

Swedish defence policy of the time amounted to a form of industrial policy. The Swedish army's procurement of supplies and equipment (cloth, uniforms, weapons, utensils, tobacco, and alcohol) were traditionally produced from local 'manufaktur' companies that were relatively large[27] and the towns where these firms were located had an advantage over other locations after the advent of the Industrial Revolution.[28] On the other hand, in the nineteenth century, engineering/industrial entrepreneurs formed another wave of new industrial firms in the country.

As the Swedish government looked for domestic industrial firms to manufacture fighters for its air force in the 1930s, some Swedish firms, in particular, the Bofors Group and AB Svenska Järnvägsverkstäderna (Swedish Railway Workshops, ASJ) became interested in manufacturing these planes. Their interest was the demonstration of possible spillovers to the aviation sector of industrial experience gained in other manufacturing sectors (weapons in the case of Bofors and railway equipment in the case of ASJ).

Bofors, one of the manufaktur companies, was a weapon manufacturer established by the Swedish Crown in 1694. Acquired by Alfred Nobel at some point, it developed into a modern industrial company during the early decades of the twentieth century. In Trollhättan, Bofors had also acquired a subsidiary company, Nohab, which manufactured aircraft engines. Bofors therefore argued that the technical expertise was already available there and it decided to establish an aircraft manufacturing company, which was named Svenska Aeroplan Aktiebolaget (Saab) on 2 April 1937 in Trollhättan.[29]

The initial share capital in Saab came from Bofors/Nohab (SEK 1.5 million) and from Sweden's Electrolux Group Axel Wenner-Gren (SEK 2.5 million). Wenner-Gren was also appointed as Saab's first chairman of the board of directors, while the head of Nohab, engineer Gunnar Dellner, was appointed CEO. Saab's facilities were constructed in 1937 in Trollhättan and a new hangar was added in 1939. Production started with the twin-engine bomber Junkers Ju 86k under licence (designated B3 in the Swedish Air Force). Over the years, Bofors continued to be an important shareholder in the overall Saab business.

A large number of skilled people were hired. Several key people joined the company. They were engineers who would steer the development of Saab in the future. Thus, the educational system helped the process. Saab also resorted to foreign manpower. Alfred Gassner, an Austrian national, was employed as chief designer. He had a background at the German Junkers and Dutch Fokker companies. Gassner operated from the AB Förenade Flygverkstäder (AFF) office in Stockholm and had a well-known aeronautical technician on his staff: Gunnar Ljungström—the subsequent creator of the Saab car. Before the Second World War there were also American engineers at Saab.

ASJ was a private company manufacturing rolling stock which was founded in 1907 in Linköping, very close to the Malmen airbase. The establishment of ASJ was a result of the growth of the railway sector in Sweden. The likes of ASJ were born during the railway boom in Sweden that started in the late eighteenth century when the railway network rapidly expanded. New towns formed around stations and firms were established to manufacture rolling stock to meet the growing demand. The operations of ASJ grew rapidly and were diversified to different product ranges such as heating boilers, hot water heaters, and heat exchangers.[30]

Furthering its diversification into other manufacturing areas, in 1930, ASJ established an aviation manufacturing subsidiary, ASJA, in Linköping and started manufacturing aircraft mostly under licence. In 1932 ASJA acquired Svenska Aero AB, a manufacturer of airplanes with facilities in Lidingö. A German entrepreneur, Carl Clemens Bücker had established Svenska in 1921 originally under the licence of the German firm *Caspar-Werke*, as the manufacture of aircraft in Germany was not allowed after the First World War. Svenska manufactured 58 airplanes under licence or as its own design. They were sold to the Swedish Air Force and private clients, and some were exported.[31]

In 1933, ASJA had less than a hundred employees. Wood was still one of the most important aircraft construction components. ASJA built a small series of aircraft. Some were ASJA's own design, such as Viking I and II, but most were built under licence. ASJ was requested by the government to expand its Linköping facilities so that its aircraft division, ASJA, would be able to accommodate future orders. ASJA started to manufacture the American Northrop 8 (known in Sweden as the B5), a single-engine, light fighter bomber in 1938.

Between 1937 and 1939, ASJA and Saab established a jointly owned company AFF to design and manufacture aircraft with an equal split of shares. Ultimately, Nohab, another Swedish industrial group, also entered the shareholding. Meanwhile, ASJA secretly continued its own designs of a single-engine reconnaissance plane, L10 (later evolved to the B17 and S17 and became Saab's first airplane) in Linköping. While the plane was a success and received orders from the air force, the cooperation in the AFF could not continue with ASJA's activities hidden from its partners in AFF.

Ultimately, AFF could not be maintained and Saab took over ASJA and its facilities in Linköping in 1939. Saab would be responsible for the development and design of the aircraft, which the Swedish Air Force ordered. The production was split to plants in Trollhättan and Linköping with some restructuring of activities. Nohab's aircraft engine manufacturing was split off from Saab and formed a separate company, which later became Svenska Flygmotor.

The role of the government was not limited to procurement. The Governor of Stockholm, Torsten Nothin, a former chairman of AFF, became Saab's chairman of the board of directors and Wallenberg was also on the board.

Earlier Aircraft Manufactured by Saab

Saab's first aircraft was named the Saab 17, which was originally designed and produced by ASJA as L10 in 1938. The bomber version was given the designation B 17 and the reconnaissance version S 17. As the Second World War began, airplane production in Sweden intensified. A total of 324 Saab 17 were sold to the Swedish Air Force and exported to Ethiopia and Denmark between 1942 and 1944. A new bomber was developed—Saab 18, which was based on ASJA designs. Between the years 1942 and 1944, 242 of them were manufactured. The reconnaissance version made history as the first aircraft of its type in Sweden and was equipped with radar. Production of the Saab 21R got started in 1947. It was one of the first aircraft in the world with a standard pilot ejector seat. A total of 60 planes were manufactured in two different versions. Subsequently, 300 Saab 21A aircraft were produced, including three test flight planes, and these were on active service in the air force until 1953. Fitted with a jet engine imported from the USA, Saab 21 became Sweden's first jet-propelled airplane.

Developing and manufacturing planes was not easy and eventless. The process was dotted with failures such as the test flight on 18 May 1940. However, these failures and risks, nevertheless, did not prevent the rise of Saab.

Venturing into Other Areas: Civilian Aviation, Automotive Sector, and Rifles

With the end of the Second World War, Saab had to venture into civilian aviation. By 1944 Saab had embarked on two civil aircraft projects—the Saab 90 Scandia, a twin-engine airliner, and the Saab 91 Safir, a single-engine trainer and private tourer. The Safir became a real success story and, in all, 323 aircraft were built for delivery to 21 countries. Other Saab civilian planes included Saab 340 (1983) and Saab 2000 (1992), which are still airborne. Saab also became a supplier to larger global aircraft companies of systems such as avionic management systems and flight control systems.

Saab's diversification continued. In 1946, another civilian project emerged—the Saab 92, front-wheel driven, 25 hp, two-cylinder automobile. Designed by Gunnar Ljungström, an aircraft designer, it was one of the aerodynamically most advanced cars ever in the world, with a drag efficiency of 0.30. That spillover from Saab's aviation roots explains the aerodynamic silhouette of the subsequent Saab cars. In time, Saab became one of the most well-known automobile manufacturers in the world, introducing many new models such as 96 (1960), 97 (1966), 99 (1968), 900 (1978), 600 (1980), 900-2 (1994), 9-5 (1997), and 9-7 (2005). In the 1980s however, it could not compete with global manufacturers and was sold to the USA's GM in 1989. In 2010 GM sold its stakes in Saab to Holland's Spiker cars, which in turn sold its share to China's Nevs, after filing bankruptcy in 2011.

Saab later ventured into other areas also: armaments aviation components and flight systems. By 2000s it was a diversified manufacturer-cum-designer of different products.

13.4 Airbus: Europe's Industrial Policy Response to the Domination of the Civilian Aircraft Market by America's Boeing

> [T]he German and French governments decided that heir countries had to have direct participation in the technically advanced, highly skilled field of aircraft manufacturing – that simply buying planes from Boeing and Douglas would not provide good jobs or advanced knowledge for their people. So, in 1970, along with Britain and Spain, they started to support Airbus with tax money. (Flanigan 1992)

The creation of European civilian aircraft industry through Airbus in the 1970s is a good example of a multinational industrial policy aiming at creating a national champion (Fig. 13.3). It was a successful project that ultimately created the world's largest civilian aircraft manufacturer, beat-

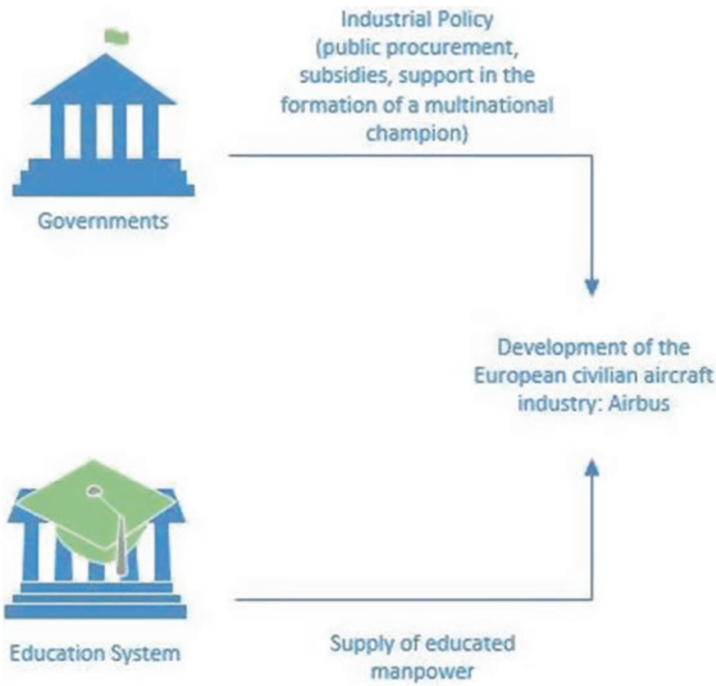

Fig. 13.3 The drivers of the Airbus project

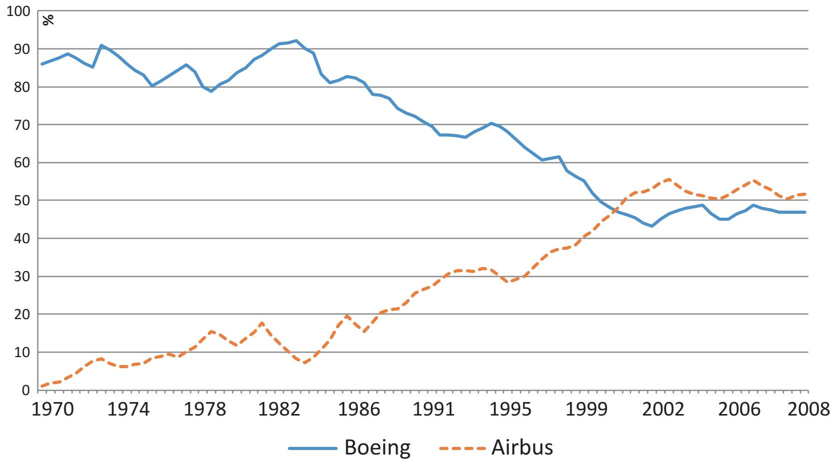

Fig. 13.4 The rise of Airbus (market share)

ing the once one and only world leader, Boeing, when Airbus was just a start-up (Fig. 13.4). Between 1972 and October 2017, Airbus delivered 10,725 airplanes, excluding the remaining orders of 6645 to be delivered in future years.[32]

Airbus was the result of West European countries' (France, Germany, England, and Spain) desire to impose their presence in a technology-intensive industry with a significant growth potential. Industrial policies involved in the creation of Airbus included significant direct and indirect subsidies from the founding governments, which received their fair share of criticism from European as well as American quarters. US Department of Commerce, for example, calculated in early 1990s that direct subsidies received by Airbus amounted to $13.5 billion over 20 years.[33] Boeing claimed in 2011 that Airbus subsidies reached $18 billion, of which $4 billion was for A380, Airbus' latest model.[34]

Supported by public subsidies, the company recorded its first profit only in 1990, more than 20 years after its genesis. However, the gains from the policy were thus apparent: from the amount of future sales and profit (and thus value-added) stream and significant technological spill-overs to other industries. Moreover, Air France played a key role by placing the first and only batch orders for A300 and A320, which were the first two Airbus models not well-known in the market then. Lufthansa also supported by placing the first orders of various Airbus aircraft. Both were involved in Airbus' development.[35] Other airlines placed their orders once Airbus carriers proved themselves under Air France.

The Background

Boeing, an American giant, almost monopolized the world's civilian aircraft market by the 1960s. There were individual European manufacturers, but they were weak to take on Boeing[36]; a combined European effort was needed to tackle the giant. The market was expected to grow in the decades to come. At this point, as in the case of Saab, European countries had a decision to make: whether to import airplanes from the USA or to develop local capabilities and industry (the industrial policy option). Buying Boeing aircraft rather than developing an industry was the lower-cost option despite the monopoly power of Boeing. The European decision makers, however, had to make a long-term calculation of costs and benefits.

Consequently, the decision was made: Europe's own civilian plane was to be developed and a local industry was to be created. But there was yet another decision to be made: Would a platform developed in the USA be used as the starting point or would a brand new one be developed? Europe took the second choice. It was the more difficult and costly option, but the deliberate selection of it meant Europe was to go for the development of an indigenous civilian aircraft industry, with all the long-term benefits.

The Genesis and the Rise of Airbus

To implement the second option, an intergovernmental memorandum of understanding was signed by Germany, France, and the UK in 1970 to design and manufacture Airbus A300, a twin-engine wide-body passenger plane. However, the UK dropped out of the partnership just after the foundation of the company, while Spain joined in 1971.

Successfully designed and manufactured, Airbus A300 made its maiden flight in 1972. Initially there were difficulties in receiving orders. That was surmounted Air France's orders. After proving itself at Air France, Airbus A300 received several orders from other airlines in 1978. Ultimately, in 1990s, it became popular with the world's major airlines and was produced until 2007. The next Airbus model, A320, first flew in 1987 and was a more visible success. Air France again assisted Airbus by ordering the first batches of A320, a twin-jet narrow-body passenger airplane. Competing with

Boeing's 737, A320 became a fast-selling model, with almost 8000 units delivered until end-2017. Under pressure from Airbus, Boeing merged with ailing McDonnell Douglas in 1997. Airbus A380, a double-deck wide-body airplane, made its first commercial flight in 2007 under the Singapore Airlines flag and became the largest civilian airplane in the world (Fig. 13.4).

The project was successful. Ultimately, Europe has become the house of one of the two largest manufacturers in the world, with market shares of Airbus reaching that of Boeing by the year 2000 from zero in 1970 (Fig. 13.3).

The Tribulations of Multinational Shareholding

Having a multi-country ownership has disadvantages in addition to its advantages.[37] The shareholding structure of Airbus has for a long time been fluid. It was only in 2001 that the company's structure was consolidated under the ownership of the Franco-German group EADS and the British aerospace and defence company BAE Systems. The British sold out in 2006, but the governments of France, Germany, and Spain, which became a full partner in 1971, continue to own stakes, either directly or indirectly.

The Airbus management has been repeatedly subjected to political meddling and unable to respond freely to commercial imperatives. Things like engine choices and manufacturing locations were the frequent subjects of political dispute:

> The easiest way to defuse tensions was to build different bits of the first plane, the A300B, in the different partner countries. The French made the cockpit, the control systems and the lower-centre section of the fuselage; the UK made the wings, and the Germans made the rest of the fuselage and a part of the centre section. The Dutch made the moving parts of the wing, the flaps and the spoilers, while the Spanish made the horizontal tail plane. The wrangles between its parent companies and the French, German and British governments have often been seen to hamper its development, forcing it to retain operations in parts of Europe which it would not necessarily have chosen had it been able to develop in the manner of a typical private sector company.[38]

Economic Impact of Airbus on Europe

Over the years, a large value of sales and a thus a significant amount of value added were generated through the Airbus project. The monetary market value of all airplanes delivered by Airbus from 1970s to September 2017 was \$1.6 trillion at 2017 current prices.[39]

Thus, while Europe initially took the costlier option, the benefits have dwarfed the costs. An economic impact study in 1995[40] indicated that the establishment of Airbus "had a large negative impact on world welfare, but a comfortably positive impact on European welfare"; the researchers calculated that Airbus would generate accumulated profits of $ 50 billion in the 50 years from 1970 and cause Boeing profits to go down by $100 billion (in 1970 prices). That is likely an underestimation.

In the EU interest in industrial policies has been returning since the early 2000s. However, in this new incarnation, rather than targeting specific sectors, the Union preferred a "broader horizontal policy that aimed at securing framework conditions favourable to industrial competitiveness."[41]

Notes

1. Kane and Pomper (2013).
2. Sung and Hong (1999: 307).
3. Sung and Hong (1999: 308).
4. Sung and Hong (1999: 308).
5. Sung and Hong (1999: 309).
6. IAEA (2007).
7. KHNP (Korea Hydro & Nuclear Power Co) was a subsidiary of KEPCO that operated Korea's nuclear and hydroelectric plants. It also provided consultancy and technical assistance services.
8. KOPEC was a KEPCO subsidiary.
9. KPS was a KEPCO subsidiary.
10. KHIC was selected, as it possessed experience in manufacturing heavy machinery. It was later privatized and changed its name to Doosan Heavy Industries.
11. KNFC was established in November 1982 by the joint investment of KEPCO and KAERI to localize the nuclear fuel fabrication for pressurized water reactors.
12. Sung and Hong (1999).
13. IAEA (2007).
14. World Nuclear Association (www.world-nuclear.org).
15. World Nuclear Association (www.world-nuclear.org).
16. Kane and Pomper (2013).
17. Kane and Pomper (2013).
18. Kane and Pomper (2013).
19. This section draws on Yulek et al. (2016).
20. Yulek et al. (2016).
21. Blomstrom and Kokko (2003: 5).
22. Eliasson (2010, 2011).

23. Eliasson (2011).
24. Some of the information in the remainder of this section draws on the websites of Bofors and Saab.
25. Eliasson (2011).
26. Blomstrom and Kokko (2003).
27. Blomstrom and Kokko (2003).
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29. Saab (2017).
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31. Andersson (1998).
32. Airbus (2017).
33. Flanigan (1992).
34. *Financial Times* (2011).
35. Newhouse (2007: 8, 16).
36. Tovey (2016).
37. Gordon (2014).
38. Gordon (2014).
39. An approximation of the author based on October 2017 Airbus price list and the number of delivered aircrafts.
40. Neven and Seabright (1995: 314).
41. Mosconi (2015: 20).

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CHAPTER 14

Putting It All Together: How Nations Succeed Through Industrial Policy?

This book narrates a wide range of ideas both vertically (historically) and cross-sectionally (ideas, sectors, countries, case studies). Below is a summary of key takeaways and policy implications.

Manufacturing Is (Still) Good While the service sector is the hotbed of employment, manufacturing is the hotbed of technology, productivity, and innovation. It is still the engine of growth. Both developed and developing economies need economic growth and technological development. Manufacturing can help both in different ways. For the developing economies manufacturing is a way to graduate from the list of low-income countries and to break out of the middle-income trap. For developed economies, which are already benefiting from manufacturing in terms of technological progress, growth, and exports, manufacturing can help reduce regional income disparities.

Industrialization Has Never Been an Accident; Industrial Policy Is Needed This or that way, there have always been policies to kick off industrialization on the part of governments. Even in the first industrializer, Great Britain, industrial policies before the Industrial Revolution prepared the way for industrialization; and once the Industrial Revolution came, Great Britain did everything to both benefit from it and keep it to itself (e.g. colonial laws). The subsequent industrializers in the nineteenth and

M. A. Yülek, *How Nations Succeed*,
https://doi.org/10.1007/978-981-13-0568-9_14

twentieth centuries (e.g. the USA, Germany, Japan, South Korea) have all employed industrial policies—whether they called them so or not. Industrial policy is still relevant for both developing and developed economies.

Industrial Policy and (General) Industrialization Policy Are Not the Same Thing General industrial policy and sectoral ('picking-the-winner') policies are relevant at different stages of industrialization. General industrial policy would most probably waste resources at Stages III and IV, as it would be spread too thin. Focused industrial policy is necessary to help a country move to Stage III from Stage II. As most of the world's countries are at Stage I or II the decision makers should be aware of this distinction.

The Government Should Have a Framework to Identify the Strategic Sectors This book proposed four criteria for that:

- Value-added potential, which directly feeds into per capita income or its growth rate in the overall economy,
- backward linkages,
- depth (potential) of LbD, and
- depth (potential) of technological learning.

Once the strategic sectors are identified, preferably four or five of the top among them should be targeted. As these sectors have linkages, even in the case of wrongly selected sectors, their positive externalities will lead to multiplying social benefits in other sectors.

Export-Led Growth Is a Pillar of Industrial Policy Up to the 1980s, many countries tried import substitution. Capitalizing on the government's control over the domestic market, the objective was to industrialize and enable domestic firms to benefit from LbD processes in manufacturing activities. The domestic market first became a livelihood and then a straitjacket for import-substituting firms. As the size of the domestic markets was not adequate for scale economies, the industrial layer was not well prepared and import and technological dependence in domestic manufacturing remained. Import-substituting countries soon faced external balance problems. Mounting imports and stagnant exports led to growing trade deficits and drainage of foreign exchange reserves.

The main exceptions to this typical faith of import substituters were Japan and South Korea. These countries followed import substitution, together with export promotion, for quite a while. Their firms benefited from larger international markets triggering *LbD* and *LbE* processes and surmounted the macroeconomic problem of decumulation of international reserves by eliminating foreign trade deficits. In the process, low-cost labour, coupled with import substitution rents in the domestic market, helped these firms offer competitive prices in the international market.

Industrialization Is Not 'Factory-zation'; It Is a Capacity-Building Process That Evolves Through Stages Many factory buildings in a country does not mean that the country has industrialized. Apple is a manufacturing company without a production facility. After the Second World War, Germany was left with almost no factories (it was also left with very few libraries, hospitals, etc. in its main cities) but it re-industrialized very quickly, as its human-institutional capacity was damaged much less than its physical capacity.

Capacity building involves physical, human, and institutional aspects. It becomes more demanding as the country proceeds along the industrialization process. Producing industrial goods through (imported) machinery (Stages I and II) is only an early and less sophisticated stage of industrialization. Generation of value added increases as the country proceeds to Stage III and then to Stage IV. So, higher capacity generates higher value added. The primary objective of industrial policy is to accelerate the industrial capacity-building process.

Industrialization Is Possible on the Back of a Strong Industrial Layer A strong and complete industrial layer is a sine-qua-non prerequisite for successful industrialization. In order to build up a strong industrial layer industrial policy should have wide-ranging tools and be part of a wider set of policies such as STI, education, and financial policies.

Beware of the Smile Curve Industrial policies should target generation of high value added from manufacturing activities. Developing countries will not make much money by manufacturing for other; you cannot increase your per capita income only by increasing productivity. You have to embrace wider (or better, the entire) segments of the smile curve. Original equipment manufacturer (OEM) manufacturing does not generate much value added and does not contribute to the current

GDP. Nevertheless, OEM manufacturing is good as a start for higher value-added manufacturing. It is typically a Stage I or II industrial activity; increasing the value added requires proceeding to further stages.

Sequencing Industrial and STI Policies General and sectoral industrial policies and STI policies have to be employed in conjunction with the stage of industrialization. Start with general industrial policies but prepare for sectoral policies as you advance. They are effective during the first two stages. Sectoral industrial policies primarily help transition from Stage II to Stage III and during Stage III. If your country is well advanced in Stage II, select your strategic sectors and allocate your resources and attention accordingly. If you are at Stage III continue with industrial policies but prepare for STI policies. STI policies are effective in transiting from Stage III to Stage IV and during Stage IV. If you are at Stage IV, use STI policies primarily.

Development-Based Public Procurement Policies DbPP policy is a powerful tool for enhancing local manufacturing companies' market access. It is a 'direct' support to such firms that can be complemented by 'indirect' measures such as investment incentives and technological or innovational support (R&D). In more advanced countries, with stronger industrial layers, procurement for innovation-type policies is more appropriate.

Subject and Place Index[1]

[1] Note: Page numbers followed by 'n' refer to notes.

M. A. Yülek, *How Nations Succeed*,
https://doi.org/10.1007/978-981-13-0568-9

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M. A. Yülek, *How Nations Succeed*,
https://doi.org/10.1007/978-981-13-0568-9