

THE CAMBRIDGE
ECONOMIC HISTORY OF

THE
MODERN
WORLD

VOLUME I
1700 to 1870

EDITED BY
STEPHEN BROADBERRY
AND KYOJI FUKAO

THE CAMBRIDGE ECONOMIC HISTORY OF
THE MODERN WORLD

The first volume of *The Cambridge Economic History of the Modern World* traces the emergence of modern economic growth in eighteenth-century Britain and its spread across the globe. Focusing on the period from 1700 to 1870, a team of leading experts in economic history offer a series of regional studies from around the world, as well as thematic analyses of key factors governing the differential outcomes in different parts of the global economy. Topics covered include population and human development, capital and technology, geography and institutions, living standards and inequality, international flows of trade and labour, the international monetary system, and warfare and empire.

STEPHEN BROADBERRY is Professor of Economic History at the University of Oxford and a Fellow of the British Academy. He has been Managing Editor of the *Economic History Review* and also the *European Review of Economic History*, and President of the Economic History Society and the European Historical Economics Society.

KYOJI FUKAO is President of the Institute of Developing Economies, Japan External Trade Organization (IDE-JETRO) and Specially Appointed Professor at the Institute of Economic Research, Hitotsubashi University. He has been President of the Asian Historical Economics Society and has published widely on Japanese and global economic history.

THE CAMBRIDGE ECONOMIC HISTORY OF
THE MODERN WORLD

The Cambridge Economic History of the Modern World offers an unprecedented global account of the emergence of modern economic growth and its spread across the world since 1700. Each volume provides a series of regional studies from across the globe, as well as thematic analyses of key factors governing differential outcomes in different parts of the global economy. Written by leading experts in economic history and covering topics such as demography and human development, capital and technology, living standards and inequality, geography and institutions, trade and migration, international finance, and warfare and empire, these volumes offer the most authoritative account to date of modern economic growth.

VOLUME I

1700 to 1870

EDITED BY STEPHEN BROADBERRY AND KYOJI FUKAO

VOLUME II

1870 to the Present

EDITED BY STEPHEN BROADBERRY AND KYOJI FUKAO

THE CAMBRIDGE
ECONOMIC HISTORY OF
THE MODERN WORLD

★

VOLUME I
1700 to 1870

★

Edited by
STEPHEN BROADBERRY

University of Oxford

KYOJI FUKAO
Hitotsubashi University, Tokyo



CAMBRIDGE
UNIVERSITY PRESS

CAMBRIDGE UNIVERSITY PRESS

University Printing House, Cambridge CB2 8BS, United Kingdom

One Liberty Plaza, 20th Floor, New York, NY 10006, USA

477 Williamstown Road, Port Melbourne, VIC 3207, Australia

314–321, 3rd Floor, Plot 3, Splendor Forum, Jasola District Centre,
New Delhi – 110025, India

79 Anson Road, #06–04/06, Singapore 079906

Cambridge University Press is part of the University of Cambridge.

It furthers the University's mission by disseminating knowledge in the pursuit of
education, learning, and research at the highest international levels of excellence.

www.cambridge.org

Information on this title: www.cambridge.org/9781107159457

DOI: [10.1017/9781316671566](https://doi.org/10.1017/9781316671566)

© Cambridge University Press 2021

This publication is in copyright. Subject to statutory exception
and to the provisions of relevant collective licensing agreements,
no reproduction of any part may take place without the written
permission of Cambridge University Press.

First published 2021

Printed in the United Kingdom by TJ Books Limited, Padstow Cornwall

A catalogue record for this publication is available from the British Library.

Two-Volume Set ISBN 978-1-108-95377-1 Hardback

Volume I ISBN 978-1-107-15945-7 Hardback

Volume II ISBN 978-1-107-15948-8 Hardback

Cambridge University Press has no responsibility for the persistence or accuracy of
URLs for external or third-party internet websites referred to in this publication
and does not guarantee that any content on such websites is, or will remain,
accurate or appropriate.

Contents

List of Figures page viii

List of Tables x

List of Contributors to Volume I xii

Preface and Acknowledgements xv

Introduction to Volume I 1

STEPHEN BROADBERRY AND KYOJI FUKAO

PART I

REGIONAL DEVELOPMENTS

1 · Britain, the Industrial Revolution, and Modern Economic Growth 21

STEPHEN BROADBERRY

2 · Continental Europe 45

GIOVANNI FEDERICO AND ANDREI MARKEVICH

3 · Tokugawa Japan and the Foundations of Modern Economic Growth in
Asia 67

MASAKI NAKABAYASHI

4 · China: The Start of the Great Divergence 97

CHRISTOPHER ISETT

5 · From the Mughals to the Raj: India 1700–1858 123

ANAND V. SWAMY

6 · Sustainable Development in South East Asia 146

JEAN-PASCAL BASSINO

Contents

7 · The Ottoman Empire, 1700–1870 169

ŞEVKET PAMUK

8 · The Economic History of North America, 1700–1870 193

JOSHUA L. ROSENBLOOM

9 · Latin America: 1700–1870 219

REGINA GRAFE

10 · Africa: Slavery and the World Economy, 1700–1870 246

PATRICK MANNING

11 · Australia: Geography and Institutions 265

DAVID MEREDITH

PART II

FACTORS GOVERNING DIFFERENTIAL OUTCOMES
IN THE GLOBAL ECONOMY

12 · Population and Human Development since 1700 289

ROMOLA DAVENPORT AND OSAMU SAITO

13 · Proximate Sources of Growth: Capital and Technology, 1700–1870 312

ALESSANDRO NUVOLARI AND MASAYUKI TANIMOTO

14 · Underlying Sources of Growth: First and Second Nature Geography 339

PAUL CARUANA-GALIZIA, TOMOKO HASHINO, AND

MAX-STEPHAN SCHULZE

15 · Institutions 369

JOHN JOSEPH WALLIS

16 · Consequences of Growth: Living Standards and Inequality 391

JAN LUITEN VAN ZANDEN, BAS VAN LEEUWEN, AND YI XU

17 · International Transactions: Real Trade and Factor Flows 412

WOLFGANG KELLER, MARKUS LAMPE, AND CAROL H. SHIUE

Contents

18 · Monetary Systems and the Global Balance of Payments Adjustment
in the Pre-Gold Standard Period, 1700–1870 438

RUI PEDRO ESTEVES AND PILAR NOGUES-MARCO

19 · War and Empire, 1700–1870 468

PHILIP T. HOFFMAN AND TIRTHANKAR ROY

Index 488

Figures

i.1	Real GDP per capita in Britain, the Netherlands, Italy, and Spain 1270–1870	page 8
i.2	GDP per capita in the leading regions of Europe and China, 1300–1850	8
1.1	Real GDP, population, and real GDP per head, England 1270–1700 and Great Britain 1700–1870	23
1.2	The implied working year of day workers, 1260s–1840s	31
1.3	Real wages and GDP per head in Britain, 1700–1870	36
3.1	International comparison of output per person, 730–1870	69
3.2	Examples of land productivity in Kinai and Kanto regions	79
3.3	Real and relative wages of carpenters and day labourers in Kinai region, 1732–1865	82
3.4	Output and land tax from the shogunate domain, 1651–1841	84
3.5	Taxation rate in the shogunate domain, 1651–1841	87
4.1	Map of China c.1912	99
5.1	India, 1785: approximate political boundaries	133
6.1	Main South East Asian cities between 1700 and 1870	148
6.2	Export of coffee and sugar from Indonesia in kg per capita	157
7.1	Revenues of the Ottoman central government as percentage of GDP, 1700–1914	174
7.2	Growth of external trade of the Ottoman Empire: ratio of exports and imports to GDP, 1820–1914	181
8.1	Probate wealth per capita by region, 1770	197
8.2	Net migration and number of migrants relative to population, 1800–60	200
8.3	US real GDP per capita, 1790–1870	201
8.4	US revenue from duties as a percentage of the value of imports, 1790–1870	209
8.5	US cotton production, 1790–1870	211
8.6	Slave prices, 1804–60	213
9.1	The fiscal governance structures: treasury districts (<i>cajas</i>) in New Spain (late eighteenth century)	225
9.2	Treasury districts (<i>cajas</i>) in Ecuador, Peru, Upper Peru, Rio de la Plata, and Chile (late eighteenth century)	226
9.3	Net revenue in Spanish America and Spain 1785–1800	227
9.4	Production of precious metals in the territories of the Spanish viceroalties and Brazil 1680–1810	230
9.5	Enslaved Africans disembarked in Latin America 1675–1875	231

List of Figures

9.6	Welfare ratios in bare-bones baskets in Spain, New Spain, Alto Peru, and Peru 1700–1800	232
9.7	Average height of adult males, 1730s to 1840	233
9.8	GDP per capita 1820–70	237
9.9	Exports per capita 1800–70	237
9.10	Silver production in Latin America 1800–60	239
10.1	African regions and major rivers	248
10.2	Value of sub-Saharan African slave exports in 1913 pounds, by region	253
10.3	Sub-Saharan African annual export value	254
11.1	Australia, real GDP per head, European population, 1801–90	274
11.2	Australia, industry shares of GDP	275
11.3	Australia, European population, 1788–1870	275
11.4	Real GDP per head, Australia (European population), UK and Great Britain, 1820–70	281
12.1	The Preston curves: real GDP per capita and life expectancy at birth in 1850 and 1913	298
12.2	Life expectancy at birth in 1850 and the average annual rate of growth in real GDP per capita over the period 1850–1913	299
12.3	Real GDP per capita in 1870 and the reduction in total fertility rate (TFR), 1870–1913	300
12.4	Educational attainment in 1870 and the reduction in total fertility rate (TFR), 1870–1913	301
12.5	Estimated average adult male height, national populations, born 1710–1930	302
13.1	Choice of technique and differential rates of technical progress	324
13.2	The expansion of mechanical engineering (vertical disintegration, specialization, and technological convergence)	326
13.3	The international diffusion of steam power technology	331
14.1	The shift in the economic centre of gravity	345
14.2	Inherent land quality	347
14.3	Past and current malaria prevalence	349
14.4	Wagon freight cost	353
14.5	Index of ocean shipping costs	353
16.1	Compound annual per capita growth rate of IHDI, c.1700–1800	404
16.2	Compound annual per capita growth rate of IHDI, c.1700–1900	404
17.1	European markets 1770–94 and 1825–49	428
17.2	China and north-west Europe, 1770–94	429
17.3	Price correlations of Yangzi Delta compared to France, 1770–94	430
18.1	Copper value of silver, Agra and East Rajasthan, 1540–1750	446
18.2	Price of wheat, Agra and East Rajasthan, 1595–1750	448
18.3	Copper value of silver, China, 1567–1820	449
18.4	Price of rice, China, 1500–1800, decennial average	450
18.5	Monetary agglomeration in the mid-eighteenth century	453
18.6	Nominal and effective exchange rates, 1820–70	458
18.7	Nominal and effective exchange rates, 1820–70	458
18.8	Nominal and effective exchange rates, by monetary regimes 1820–70	459

Tables

i.1	GDP per capita by region, 1500–1870	<i>page</i> 4
i.2	Growth rates of GDP per capita by region	6
1.1	Annual growth rates of real GDP, population, and real GDP per head, Great Britain 1700–1870	24
1.2	Sectoral shares in nominal GDP and the labour force, England 1381–1700 and Great Britain 1700–1870	25
1.3	Sectoral annual growth rates of output, labour force, and labour productivity, England 1381–1700 and Great Britain 1700–1851	26
1.4	Levels of GDP per head in Europe and Asia	27
1.5	Accounting for British GDP growth, 1700–1860, two-factor model	29
1.6	Accounting for British GDP growth, 1760–1913, three-factor model	30
1.7	Exports as a share of national output and its growth	39
2.1	The structural transformation: Europe around 1870	50
3.1	Gross domestic product and population, 730–1874	77
3.2	Output of rice and acreage of paddy fields	78
3.3	Output of rice per person	78
4.1	Per capita GDP for China, Japan, and England 1500–1850	115
4.2	Indices of output per worker in Chinese agriculture, 1600–1911	115
4.3	Comparing estimates of Chinese per capita GDP, 1600–1911	116
5.1	Taxes assigned and collected, Bihar 1685–1750	128
5.2	Population, GDP, and per capita GDP, India 1600–1871	129
5.3	Silver and grain wages of unskilled labourers in England and India 1550–1849	131
5.4	Opium exports and revenues, 1789–1859	136
5.5	Indian exports: commodity composition, percentage share of selected items in total value, 1811–12 to 1850–51	136
6.1	Total population and population density by kingdoms or regions	147
6.2	Estimates of urban population from the late seventeenth to the mid-nineteenth centuries	154
6.3	Annual average value by decade of three main South East Asian exports	156
8.1	The proximate sources of growth, US 1800–90	201
8.2	US labour force, 1800–70	208
10.1	Total and slave populations, selected decades	250
13.1	The production process in six economic epochs	315
13.2	Number and power of European waterwheels, 1200–1800	316

List of Tables

13.3	The west European merchant fleet	317
13.4	Structure of capital stock (percentage share) in Great Britain by sector, 1760–1870	319
13.5	Structure of capital stock (percentage share) in Great Britain by type of asset, 1760–1870	320
13.6	Investment as share (percentage) of gross national product in selected countries, 1770–1913	321
13.7	Capital per worker in selected countries	322
13.8	Labour productivity in cotton spinning	324
13.9	Sources of power in use in Britain (mainly mining and manufacturing)	328
13.10	Contributions of steam power to labour productivity growth by stationary steam engines, 1760–1910	329
13.11	Share of ‘steam’ capital in the total capital stock (Britain, 1760–1907)	330
14.1	GDP per capita	343
14.2	Shares in world manufacturing output	344
14.3	Per capita levels of industrialization	344
14.4	World’s largest cities	351
14.5	Share of the population living in urban areas	355
14.6	Market potential	357
14.7	GDP per capita and market potential	359
16.1	GDP per capita in 1990 international dollars	393
16.2	Mean age at death for the population over five years of age	395
16.3	Average years of education	399
16.4	Inequality-adjusted human development index	403
17.1	Openness and the growth of trade	414
18.1	Volatility of exchange rates, 1830–70	460
19.1	Frequency of foreign wars in China and Europe, 1500–1799	471
19.2	Central government annual tax revenue per capita	471

Contributors to Volume I

JEAN-PASCAL BASSINO, Department of Social Sciences, École Normale Supérieure, Lyon
STEPHEN BROADBERRY, Department of Economics, University of Oxford
PAUL CARUANA-GALIZIA, Department of Economic History, London School of Economics
ROMOLA DAVENPORT, Department of Geography, University of Cambridge
RUI PEDRO ESTEVES, Departments of International Economics and International History, The Graduate Institute, Geneva
GIOVANNI FEDERICO, Social Science Division, NYU Abu Dhabi
KYOJI FUKAO, Institute of Economic Research, Hitotsubashi University
REGINA GRAFE, Department of History and Civilization, European University Institute
TOMOKO HASHINO, Graduate School of Economics, Kobe University
PHILIP T. HOFFMAN, Division of the Humanities and Social Sciences, California Institute of Technology
CHRISTOPHER ISETT, College of Liberal Arts, University of Minnesota
WOLFGANG KELLER, Department of Economics, University of Colorado
MARKUS LAMPE, Institute for Economic and Social History, Vienna University of Economics and Business
PATRICK MANNING, Department of History, University of Pittsburgh
ANDREI MARKEVICH, New Economic School, Moscow
DAVID MEREDITH, Faculty of History, University of Oxford
MASAKI NAKABAYASHI, Institute of Social Science, University of Tokyo
PILAR NOGUES-MARCO, Department of History, Economics and Society, University of Geneva
ALESSANDRO NUVOLARI, Institute of Economics, Sant'Anna School of Advanced Studies, Pisa
ŞEVKET PAMUK, Ataturk Institute for Modern Turkish History, Bogazici University
JOSHUA L. ROSENBLUM, Department of Economics, Iowa State University
TIRTHANKAR ROY, Department of Economic History, London School of Economics
OSAMU SAITO, Institute of Economic Research, Hitotsubashi University
MAX-STEPHAN SCHULZE, Department of Economic History, London School of Economics
CAROL SHIUE, Department of Economics, University of Colorado
ANAND V. SWAMY, Department of Economics, Williams College

Contributors to Volume I

MASAYUKI TANIMOTO, Graduate School of Economics, University of Tokyo
BAS VAN LEEUWEN, International Institute of Social History, Amsterdam
JAN LUITEN VAN ZANDEN, Department of History, Utrecht University
JOHN JOSEPH WALLIS, Department of Economics, University of Maryland
YI XU, Historical Culture and Tourism College, Guangxi Normal University

Preface and Acknowledgements

Within a generation, economic history has globalized. Forty years ago, most economic history research and teaching focused on national trends, and was conducted by local scholars in their own language. International travel was expensive and communication difficult, with international conferences few and far between. Today, there is a large literature on most regions of the world written in English, and a growing trend in co-authorship has facilitated a comparative approach, and encouraged researchers to present their findings within a global framework. These trends are most advanced in the period from around 1700, which led us to the idea of producing a *Cambridge Economic History of the Modern World*.

A traditional strength of economic history has always been its firm grounding in the local context, and we believe that the embracing of the global must not come at the expense of the institutional details of national and regional history. Here, we are fortunate in being able to draw on other volumes in the Cambridge Economic History series, which at the time of writing covers Europe, Modern Britain, Modern Europe, the United States, India, Australia, Latin America and the Greco-Roman World, with other titles in preparation. As a result, we made a decision to start each volume with a series of regional chapters before moving on to a consideration of the key themes within a global context. Here, we have been able to draw on the growing use of quantitative data and accessible economic analysis that has occurred in recent years. We have also chosen to focus on the issue of economic growth and development, to provide a unifying framework and keep the project down to a manageable length.

The large number of authors needed for the two volumes are drawn from international networks straddling the major regions of the world. The editors have been deeply involved in the Asian Historical Economics Conference (AHEC), the European Historical Economics Society (EHES), the Economic History Society (EHS), the Economic History Association (EHA), the

International Economic History Association (IEHA), the Maddison Project, the Economic History Programme of the Centre for Economic Policy Research (CEPR) and the Centre for Competitive Advantage in the Global Economy (CAGE) at the University of Warwick. Authors were also recruited through relations with a number of other organizations, including the African Economic History Network (AEHN), the Economic History Society of Australia and New Zealand (EHSANZ) and *Revista de Historia Económica – Journal of Iberian and Latin American Economic History* (RHE-JILAEH). The cohesion provided by these informal networks has been crucial in ensuring that the project could be completed in a timely fashion.

We put our authors through two gruelling conferences at which we discussed chapter drafts, held at Oxford in 2017 and Tokyo in 2018. We are extremely grateful to the Hitotsubashi University Institute of Economic Research, the Oxford University Department of Economics and Nuffield College for their financial and organizational support of these conferences. Additional funding was provided by Hitotsubashi Institute for Advanced Study (HIAS), Hitotsubashi University and Grant-in-Aid for Scientific Research (S) Grant Number 16Ho6322 Project ‘Service Sector Productivity in Japan (SSPJ): Determinants and Policies’. We would also like to thank all the contributors for their enthusiasm and stamina.

Introduction to Volume I

STEPHEN BROADBERRY AND KYOJI FUKAO

This book tells the story of the beginnings of modern economic growth, or the sustained increase of per capita incomes together with population growth, surely one of the most important developments in world history. Part I on regional developments documents how modern economic growth first emerged in eighteenth-century Britain, and follows its spread to other parts of the world. Its origins can be traced back to earlier developments in north-west Europe, which began to break free from the Malthusian cycle of alternating periods of positive and negative growth after the arrival of the Black Death in the mid-fourteenth century. Europe thus experienced a Little Divergence as the rest of the continent continued to experience periods of shrinking as well as growing. Within Asia, there was also regional variation, with China and India experiencing negative growth during the eighteenth century while Tokugawa Japan caught up with China and then forged ahead, creating an Asian Little Divergence. Pinning down the timing of the Great Divergence between Europe and Asia in the face of such regional variation requires taking account of the richest economies in both continents, as well as the continent-wide averages, and this suggests that Asia fell behind decisively only during the eighteenth century. A further reversal of fortune also occurred in the Americas, with North America overtaking the previously richer Latin America. The United States had already made the transition to modern economic growth by the early nineteenth century, and by 1870 Japan was poised to become the first Asian economy to experience modern economic growth, following the Meiji Restoration of 1868.

Part II examines the factors governing the differential outcomes of the economies described in Part I. One approach is to focus on the proximate factors that explain the different outcomes, such as investment in physical and human capital and the development of better technology. These factors unquestionably played an important role. However, this merely raises

further questions about why the economies that innovated in these areas did so, and even more puzzlingly, why the lagging economies did not follow them. This leads naturally to the consideration of more fundamental factors, which can be broken down into geography and institutions. Most historical accounts of economic growth and development discuss the importance of first nature geography, including factors such as natural resources and climate. This book is unusual in also discussing second nature geography, focusing on agglomeration economies and location near to buoyant markets, drawing on recent research in ‘new economic geography’. These agglomeration effects can help to understand how peripheral economies remain locked out of economic development. Perhaps one of the biggest changes in economic history over the last two or three decades has been the growing influence of research on institutions. Defined as the ‘rules of the game’, institutions can be seen as setting incentives for socially productive activities such as trade, investment, and innovation. Since these incentives need to be stable over time to have a significant effect on growth and are widely perceived to be difficult to change, they are also helpful in understanding differential economic performance in history.

The book thus seeks to provide an overview of the modern world economy from around 1700 to 1870, dealing with the material in such a way as to give due weight to chronology, regional balance, and coverage of the main topics. It forms part of a two-volume publication, with the second volume taking the story from 1870 to the present. It draws on the upsurge of literature on the economic history of most regions of the world that has occurred in recent years, much of it available in the English language, but also firmly grounded in national literatures written in other languages. Much of this literature has also been based on quantitative data and makes explicit use of economic analysis, but in an accessible way. The book is aimed at a wide audience of historians and social scientists.

Part I: Regional Developments

Traditionally, economic historians have seen the world as stuck in a Malthusian trap until the eighteenth century, where any short-term gain in living standards led to an increase in the population, which resulted in the temporary gains being eaten away by the expanded population (Clark 2007). Fluctuations in living standards could thus occur, but without any long-term trend until the Industrial Revolution of the eighteenth century broke this mould. Following its beginnings in Britain, modern economic growth spread

quickly to other parts of Europe and the British offshoots in the New World (Landes 1969; North and Thomas 1973; Landes 1998). On this view, the Great Divergence thus occurred largely as a result of the emergence of sustained growth in the West and continued stagnation in the rest of the world. Furthermore the breakthrough in the West is often portrayed as building upon institutional foundations laid during the early modern period, or even reaching back to the medieval period (Weber 1930; Pirenne 1936).

This traditional view requires some modification in the light of recent research to quantify long run trends in income within a national accounting framework. Table i.1 sets out trends in the level of average per capita income in the world economy between 1500 and 1870, as measured by per capita gross domestic product (GDP). The process of quantifying global economic performance in this way was begun by Maddison (2001), who had to rely on conjectures for many of his pre-nineteenth century estimates. Since then, much work has been done to build up a more complete picture based on hard data, although the project continues (Bolt and van Zanden 2014). Following Maddison, GDP per capita estimates for each country are presented in terms of a common currency unit, 1990 international dollars, so that they can be compared across both space and time. Although this clearly creates index number problems, it is likely that these are dwarfed by measurement errors, and the exercise should be treated as indicating broad trends rather than being correct to the second decimal point. To fix orders of magnitude, it is worth bearing in mind that in 1990 the World Bank regarded anyone existing on less than \$1 per day as living in poverty. This means that the minimum GDP per capita consistent with a society being able to support itself and reproduce should be around \$400, with most people living on \$1 per day and a small elite who may have been much richer but had only a small impact on the average income.

Table i.1 shows that there was no simple story of per capita incomes rising slowly from 1500 in Europe and the British offshoots and then accelerating from the eighteenth century while incomes continued to stagnate in Asia, Latin America, and Africa throughout the period. Clearly, there was not just considerable variation in outcomes between the main regions, as would be consistent with the traditional view, but also systematic variation in outcomes within regions. First, the strong upward trend in per capita income within Europe was confined to the North Sea area economies of Britain and the Low Countries (van Zanden and van Leeuwen 2012; Broadberry et al. 2015a). The North Sea area forged ahead of the previously richer Mediterranean economies of southern Europe, particularly Italy, in what

Table i.1 GDP per capita by region, 1500–1870 (1990 international dollars)

	1500	1600	1700	1750	1800	1870
Great Britain	1,041	1,037	1,513	1,695	2,097	3,657
Netherlands	1,119	2,049	1,620	1,812	2,008	2,744
Belgium	1,467	1,589	1,375	1,361	1,479	2,692
Sweden	1,086	761	1,340	973	857	1,345
NW EUROPE	1,149	1,201	1,471	1,487	1,684	2,953
France	1,063	1,010	1,063	1,052	1,126	1,876
Italy	1,533	1,363	1,476	1,533	1,363	1,542
Spain	846	892	814	783	916	1,207
Portugal	724	665	957	1,331	775	809
SOUTHERN EUROPE	1,154	1,096	1,142	1,161	1,144	1,590
Germany	1,146	807	939	1,050	986	1,839
Poland	702	810	569	602	634	946
CENTRAL & EASTERN EUROPE	880	809	728	786	795	1,333
EUROPE	1,050	996	1,040	1,060	1,087	1,741
China	852	859	1,089	749	654	530
Japan	545	667	675	675	828	1,011
India	600	682	622	573	569	533
Java					507	517
Ottoman Empire	620	620	640	720	700	850
ASIA	715	766	817	676	634	540
US (settlers only)			1,238	1,277	1,296	2,445
US (multicultural)	400	400	480	747	1,164	2,415
Australia					518	3,273
BRITISH OFFSHOOTS	400	400	480	747	1,143	2,419
Mexico	400	497	919	807	813	651
Peru	400	579	727	694	665	694
LATIN AMERICA	400	525	876	785	788	794
Cape Colony/S. Africa			1,703	1,692	959	807
AFRICA	440	440	440	460	460	613
WORLD	717	763	812	719	702	884

Sources: Adapted from [Maddison \(2001: 264\)](#) and the Maddison Project Database, version 2013 ([Bolt and van Zanden 2014](#)), incorporating new long run series as follows: GB: [Broadberry et al. \(2015a\)](#); Netherlands: [van Zanden and van Leeuwen \(2012\)](#); Belgium: [Buyst \(2011\)](#); Sweden: [Schön and Krantz \(2012\)](#); [Krantz \(2017\)](#); France: [Ridolfi \(2016\)](#); Italy: [Malanima \(2011\)](#); Spain: [Álvarez-Nogal and Prados de la Escosura \(2013\)](#); Portugal: [Palma and Reis \(2017\)](#); Germany: [Pfister \(2011\)](#); Poland: [Malinowski and van Zanden \(2017\)](#); China: [Broadberry et al. \(2018\)](#); Japan: [Bassino et al. \(2019\)](#); India: [Broadberry et al. \(2015b\)](#); Java: [van Zanden \(2012\)](#); Ottoman Empire: [Pamuk \(2006; 2009\)](#); United States: data for US settlers from [Sutch \(2006\)](#) for 1800–70 and [Mancall and Weiss \(1999\)](#) for 1700–1800; multicultural estimates derived using information on Native American Indian population from [Ubelaker \(1992\)](#); Mexico and Peru: [Arroyo Abad and van Zanden \(2016\)](#); Cape Colony/South Africa: [Fourie and van Zanden \(2013\)](#).

has come to be known as the European Little Divergence, to set against the backdrop of the Great Divergence between Europe and Asia. Although less quantitative information is available for central and eastern Europe, the data that we do have for Poland suggest that the region continued to lag behind the rest of the European continent (Malinowski and van Zanden 2017). These trends are discussed in Chapters 1 and 2.

Second, within large parts of Asia, incomes did not just stagnate but actually trended downwards significantly. Of most significance here is the decline in Chinese GDP per capita during the Qing dynasty, but there was also a downward trend in India from the high point of the Mughal Empire under Akbar (Broadberry et al. 2015b; 2018). These trends are examined here in Chapters 4 and 5, respectively. At the same time, however, Chapter 3 shows that there was a clear upward trend in Japan, which went on to be the first non-Western economy to achieve modern economic growth after the Meiji Restoration of 1868 (Bassino et al. 2019). This reversal of fortunes between Japan and China represents an Asian Little Divergence to set alongside the European Little Divergence (Broadberry 2013). In west Asia, incomes continued to increase within the Ottoman Empire, but more slowly than in Japan (Pamuk 2009). There is less quantitative information available for South East Asia, but for Java, where we do have data for the nineteenth century thanks to the work of van Zanden (2012), incomes stagnated. Developments in South East Asia and the Ottoman Empire are outlined in Chapters 6 and 7, respectively.

Third, the European settlers who arrived in the New World from the sixteenth century experienced varying fortunes, with the British offshoots achieving better outcomes for living standards than the Latin American economies in the long run. However, the national accounting data suggest that until the eighteenth century Mexico and Peru outperformed the British American Colonies that later formed the United States (Arroyo Abad and van Zanden 2016). This is consistent with a third reversal of fortunes between the British offshoots and Latin America (Engerman and Sokoloff 1997). Before the arrival of permanent settlers from Europe in North America from the early seventeenth century and in Australia from the late eighteenth century, the lands were inhabited by tribes who are normally assumed to have lived close to subsistence income of \$400 per year. It should be noted that the incomes of indigenous peoples are included in Maddison's per capita GDP estimates for Australia, in the multicultural estimates for the United States and also in the estimates for Mexico and Peru, which therefore remained relatively low for some time after colonization until the growing settler communities

Table i.2 Growth rates of GDP per capita by region (percentage per annum)

	1500–1700	1700–1750	1750–1800	1800–1870
North-west Europe	0.12	0.02	0.25	0.80
Southern Europe	0.00	0.03	−0.03	0.47
Central-eastern Europe	−0.09	0.15	0.02	0.74
Total Europe	0.00	0.04	0.05	0.67
Asia	0.07	−0.38	−0.12	−0.17
British offshoots	0.09	0.88	0.85	1.09
Latin America	0.39	−0.22	0.01	−0.25
Africa	0.00	0.09	0.00	0.41
World	0.06	−0.24	−0.05	0.33

Source and notes: Derived from [Table i.1](#). North-west Europe = GB, NL, Belgium, Sweden; Southern Europe = France, Italy, Spain, Portugal; central-eastern Europe = Germany, Poland.

outnumbered the declining native populations.¹ North America and Latin America are covered in [Chapters 8](#) and [9](#), respectively, while Australia is discussed in [Chapter 11](#).

Fourth, there are also signs of substantial regional variation in economic outcomes within Africa, as noted in [Chapter 10](#). In addition to the data for the whole of Africa in [Table i.1](#), we have included estimates of per capita income in South Africa, based on available data for the Cape Colony, which clearly generated high incomes for its Dutch settler population in the eighteenth century ([Fourie and van Zanden 2013](#)).² Furthermore, the data on African exports presented in [Chapter 10](#) are also suggestive of substantial fluctuations in income, with significant phases of shrinking (or negative growth) as well as positive growing.

The data from [Table i.1](#) can be used to calculate the annual growth rates of per capita GDP in [Table i.2](#). This reveals the generally low rates of growth achieved even in the successful north-west European economies, at just 0.8 per cent in the period 1800–70. Note that the growth rate was faster in the British offshoots from the eighteenth century, but because they were starting from a lower level of per capita income, they had still not forged ahead of Great Britain by 1870. Asia experienced negative growth (or

¹ The incomes of the colonists considered alone were substantially higher, as shown in the US (settlers only) estimates, and the issue of their level relative to the Old World will be addressed below.

² Note, however, that [Fourie and van Zanden \(2013\)](#) make no allowance for the indigenous African population.

shrinking) in three out of the four periods, while Latin America also shrank in the first half of the eighteenth century and stagnated during the nineteenth century. Africa experienced the most stagnant long run economic performance, but it is likely that better data would reveal greater volatility with more significant periods of shrinking interspersed between periods of growing.

One striking feature of [Table i.2](#) is that most regions experienced negative per capita income growth over periods of half a century or more as well as periods of positive growth. This points to an important role for changes in the extent of shrinking (or periods of negative growth) as well as positive growing. Where annual information is available back as far as the late thirteenth century, the new data reveal that what makes the difference between a successful economy with an upward trend in per capita income and an economy that stagnates over the long run lies largely on the shrinking rather than the growing side. In other words, successful North Sea area economies like Britain and the Netherlands overtook Mediterranean economies like Italy and Spain not by growing faster when they grew, but rather by shrinking more slowly when they shrank and by experiencing fewer years of shrinking ([Broadberry and Wallis 2017](#)). This can be seen in [Figure i.1](#), which plots the annual observations of GDP per capita for these four economies between the late thirteenth and the late nineteenth centuries. Of particular importance was the fact that the gains in per capita income after the mortality crisis of the Black Death in the mid-fourteenth century were never reversed in Britain and the Netherlands as population recovered from the mid-fifteenth century.

Two major issues that continue to be debated by economic historians can be addressed with the data from [Table i.1](#): the timing of the Great Divergence and comparative living standards in the New World and the Old World before the twentieth century. The data on average incomes in [Table i.1](#) suggest that Europe was already ahead of Asia during the early modern period, with a European advantage of around 25 per cent in 1700. However, before concluding that the Great Divergence was already under way by 1500, it is worth bearing in mind that Asia had a population four times the size of Europe's. [Pomeranz \(2000\)](#) claimed that Europe-Asia comparisons should be made on the basis of similarly sized units and set out to show that the leading regions of Asia, such as the Yangzi Delta in China, were on a par with the leading regions of Europe as late as 1800. [Figure i.2](#) addresses this issue by comparing GDP per capita in the leading regions of Europe and China. The income of the European leader is based on Italy until the 1540s, followed by the Netherlands until the 1800s and then Great Britain. For China, we know

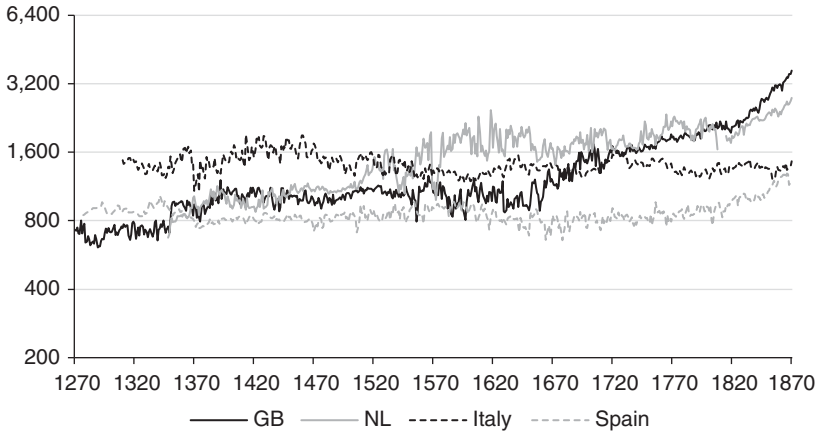


Figure i.1 Real GDP per capita in Britain, the Netherlands, Italy, and Spain 1270–1870 (1990 international dollars, log scale)

Sources: GB: [Broadberry et al. \(2015a\)](#); Netherlands: [van Zanden and van Leeuwen \(2012\)](#); Italy: [Malanima \(2011\)](#); Spain: [Álvarez-Nogal and Prados de la Escosura \(2013\)](#).

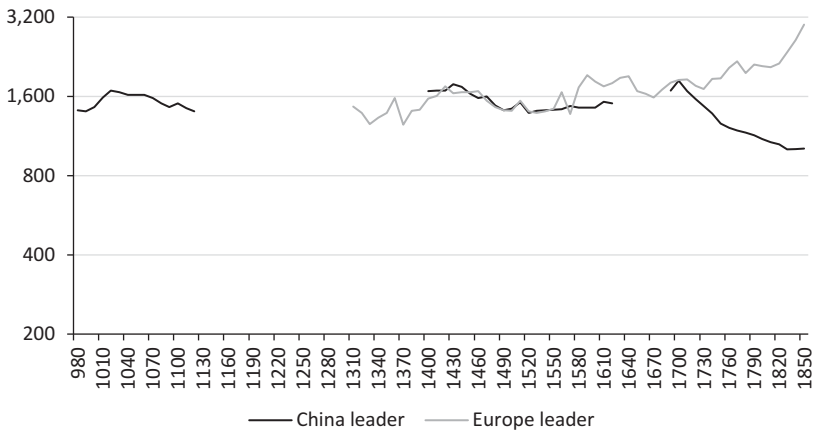


Figure i.2 GDP per capita in the leading regions of Europe and China, 1300–1850 (1990 international dollars)

Source: [Broadberry et al. \(2018\)](#).

that the income level in the Yangzi Delta in the 1820s was 75 per cent higher than in China as a whole ([Li and van Zanden 2012](#)). The China leader series is obtained by projecting this ratio back in time. Note that this does not require that the Yangzi Delta was always the richest region, just that there was always at least one region that was around 1.75 times the average for China

as a whole. It is clear that a substantial gap opened up between the leading regions of Europe and China during the eighteenth rather than the nineteenth century. [Pomeranz \(2011; 2017\)](#) now accepts that his early claim that the Great Divergence began only in the nineteenth century was exaggerated, and agrees that the eighteenth century was more likely, but notes that this is still a lot later than traditionally assumed.

Turning to the issue of living standards in the New World compared with Europe, [Maddison's \(2010\)](#) estimates of GDP per capita for the territory of the modern United States show a continued British advantage until the late nineteenth century, and this is also reflected here in the estimates of [Table i.1](#). This has been the subject of some controversy, with [Prados de la Escosura \(2000\)](#) and [Ward and Devereux \(2003\)](#) claiming that the United States was already ahead by the mid-nineteenth century, while [Broadberry \(2003\)](#) and [Broadberry and Irwin \(2006\)](#) continued to support Maddison's view. The first point to note is that the multicultural estimates include Native American Indians living at subsistence, which substantially lowers average income in the seventeenth and eighteenth centuries, and continues to have an impact during the nineteenth century, although the British advantage remains if attention is confined to the living standards of the US settlers in [Table i.1](#). A second factor to consider is the existence of slavery, which serves as another reminder that until the 1860s the southern United States could not be considered a modern economy. Slaves accounted for 12.6 per cent of the US population in 1860 ([Haines 2006](#)).

Confining attention to free members of the settler population, it seems likely that for many, per capita incomes were at least as high as those in the countries from which immigrants were attracted. Indeed, [Allen et al. \(2012\)](#) demonstrate higher real wages in the American colonies than in Britain all the way back to the mid-seventeenth century. Nevertheless, even here it is worth noting that although staple commodities were available in greater abundance in the New World than in Europe as a result of the easy availability of land, manufactured goods and services were much harder to come by before the late nineteenth century. In these circumstances, living standards appear higher in the New World if incomes are compared using the prices of a basket of staple commodities, but this advantage disappears as more manufactured items or services are included. A suggestive study by [Geloso \(2015\)](#) demonstrates this for a comparison between New France (the current Canadian province of Quebec) and France during the period 1688–1760, using [Allen's \(2009\)](#) 'bare bones' and 'respectability' baskets. [Geloso \(2015: 99\)](#) concludes that 'the inhabitants of New France could more easily satisfy

their basic needs. However, rising beyond that point was harder. Any advantage enjoyed at the bare bones level disappears at the respectable level.' A further point worth remembering in the US case is that warfare took its toll on two occasions, during the War of Independence (1776–83) and the Civil War (1861–65). A recent contribution by [Lindert and Williamson \(2016\)](#) argues that the thirteen colonies were ahead of Britain in the eighteenth century, but fell back behind by 1800 as a result of destruction wrought during the War of Independence. Lindert and Williamson then see the United States as regaining the lead by 1850, but suffering another setback during the 1860s due to the Civil War, and then finally forging ahead permanently after 1870, as in the conventional Maddison chronology.

Although GDP per capita is widely used as a measure of living standards, it is at best an incomplete measure, and needs to be supplemented by additional information. Two important variables widely monitored are life expectancy and education, which tend to show smaller differences between nations than GDP per capita. The human development index (HDI), which combines GDP per capita with measures of life expectancy and education is sometimes used as a composite measure of the standard of living ([UNDP 1990](#)). In its standard form, however, the HDI is still subject to the shortcoming that it is based on mean values and therefore cannot say anything about the distribution of welfare across individuals. To take account of distributional issues, it is necessary to incorporate measures of inequality such as the Gini coefficient or the Atkinson inequality index. These issues are considered in [Chapter 16](#).

Part II: Factors Governing Differential Outcomes in the Global Economy

Part II explores the factors governing differential outcomes in the various regions that are examined in Part I. An important distinction is made between the proximate and fundamental sources of growth, while a final section analyses the world economy as a system.

The Proximate Sources of Growth

Growth accounting helps us to assess whether economic growth came from the use of more factor inputs or from the more effective use of existing inputs ([Solow 1957](#)). In the simplest formulation, aggregate output is produced using factor inputs of capital and labour. The growth rate of output can then be related to the growth rates of the inputs of capital and labour and a residual factor representing any change in the efficiency with which the factors are

used. Each factor is weighted by its relative importance in the production process, measured by its share in the costs of production. For labour this is the share of wages in the value of output, while for capital it is the share of profits. The residual factor, known as total factor productivity (TFP) is often associated with technological progress, but it can also reflect changes in organization, such as the introduction of the factory system.

Labour, which is considered in [Chapter 12](#), has always been an important factor input. In addition to the increase in the number of workers as population grows, it is necessary to consider the quality of workers, particularly as a result of investment in human capital. More educated workers should be able to produce more output, so an increase in education should raise the growth rate, other things being equal. However, education is costly to provide, so as production becomes more complex with economic development, parents may face a choice between having a small number of well-educated children or a larger number of poorly educated children. Such considerations must inevitably impact on decisions about fertility, and are now considered by many economists to be central to understanding the demographic transition from a poor economy with high rates of fertility and mortality to a rich economy with low rates of fertility and mortality ([Galor 2005](#)).

Capital and technology accounted for an increasing share of growth between 1700 and 1870, and are considered here in [Chapter 13](#). The growing importance of capital reflected in turn the growing importance of fixed capital relative to working capital, while the growing importance of technological progress reflected the growth of mechanization and the use of the steam engine as a major source of power.

The Ultimate Sources of Growth

Even if we had perfect information on the proximate sources of growth, however, this would only tell us *how* the transition to modern economic growth occurred, rather than *why* it occurred. If some economies grew faster than others because of more investment or faster technological progress, we would want to know why investment and technological progress were faster in those economies. Economists divide the more fundamental underlying sources of growth into two categories: geography and institutions.

The role of geography can be analysed using the distinction between first and second nature geography. First nature geography covers natural endowments such as mineral deposits or climate, while second nature geography covers man-made factors such as access to markets and agglomeration

economies. First nature geography has traditionally featured heavily in explanations of differential performance during the Industrial Revolution, with coal deposits playing an important role in the location of industry. Recently, however, a new literature has arisen, emphasizing the importance of second nature geography (Krugman and Venables 1995). The basic idea here is that exogenously given first nature geography advantages or disadvantages become amplified rather than reduced by forces of economic integration. Favourable locations with high productivity are seen as attracting people and investment, which further raises productivity. Unfavourable locations with low productivity attract fewer people and investment, thus falling further behind. Reductions in the cost of trade may thus have asymmetric effects on different regions, with industry clustering in a few favourable locations rather than being dispersed evenly around the world. Building on the approach of Crafts and Venables (2003), Chapter 14 assesses to what extent the differential outcomes in the global economy over the period 1700–1870 can be explained using this new approach.

One of the key developments in economic history in recent decades has been the systematic analysis of institutions as a fundamental determinant of economic performance. A key player in the development of this analysis was the Nobel laureate Douglass North, who defined institutions as ‘the rules of the game and the means of enforcement’ (North 1990: 3). John Wallis draws an important distinction in Chapter 15 between primary and secondary rules. Primary rules are the rules that directly govern behaviour, such as traffic laws, property laws, and criminal laws, while secondary rules are the rules that govern the formation or alteration of the primary rules. Primary rules can be seen as structuring the economic system and secondary rules the political system. Understanding the role of institutions in explaining differential outcomes in the global economy therefore requires more than considering primary institutions such as property rights, but also requires an analysis of secondary institutions such as democracy or dictatorship, and how primary and secondary rules interact. Wallis contrasts the case of British North America, where modern economic growth began in this period, with Latin America, where it did not. He also considers the case of Japan, which underwent a radical institutional change with the Meiji Restoration of 1868.

The Global Economy

The world economy can clearly be broken down into its regional components as in Part I of this volume. However, it is also helpful to think of the

world economy as a global system, governing international transactions, such as international trade and migration and international finance. It is also important to stand back and assess the roles of warfare and empire. This can be useful in guarding against a tendency of earlier generations of economic historians to focus only on the effects of European developments on the rest of the world, without paying much attention to the impact of developments flowing in the opposite direction. Whilst the two-way nature of these reciprocal flows became too obvious to ignore in the second half of the twentieth century, they also need to be borne in mind when considering earlier eras.

The real flows of goods (via international trade) and labour (via migration) between 1700 and 1870 tell the story in [Chapter 17](#) of the integration of product and factor markets in different parts of the world. There is overwhelming evidence of a greater trend towards market integration after 1820 than before, as the global economy was transformed by a host of revolutionary technologies in transportation and communications ([O'Rourke and Williamson 2002](#)). Warfare can be seen as a major barrier to integration during the eighteenth century, culminating in the disruption of the French Revolutionary and Napoleonic Wars (1792–1815), which were fought not just in Europe, but also in the Middle East, North America, the Caribbean, India, and South East Asia. After about 1820, market integration received a boost not just from declining transport costs as a result of technological progress but also from a shift in trade policy away from mercantilism towards free trade.

The international monetary system, analysed in [Chapter 18](#), was based largely on silver and gold during the early modern period. With well-integrated bullion markets, countries were forced to coordinate legal ratios to preserve bimetallism. An important exception here was England, which was effectively on a gold standard *de facto* from 1717 and *de jure* from 1816. During the third quarter of the nineteenth century, many other nations switched away from a bimetallic standard and the gold standard emerged at the heart of the international monetary system. Early modern intercontinental trade occurred with a steady flow of silver from the Americas in the West to Asia in the East, mainly via Europe, although there were also some direct flows from the Americas to Asia via the Philippines. Commodity money was replaced by bills of exchange to transfer funds for long-distance trade and finance, with the bills of exchange market being progressively enlarged from a European system in the mid-eighteenth century to a global system by the mid-nineteenth century.

Economic historians often focus on pre-war, post-war, and interwar periods, as if warfare was some kind of anomaly and minor disruption to normal events rather than a common occurrence that could sometimes lead to major turning points in history. Yet China as well as the major European powers spent more than half the time between 1500 and 1799 at war with foreign enemies, and by 1914, as much as 84 per cent of the world was under European control, either directly or as a now independent colony dominated by Europeans. [Chapter 19](#) therefore considers warfare and empire as a separate topic within the framework of international transactions. How did Europeans come to so dominate the world? Part of the answer must lie in the higher incomes and better technology afforded by their earlier transition to modern economic growth, which provided more resources for warfare. However, European states also raised more tax revenue per head, formed credible alliances and designed effective armies.

Although there is a minority view that sees colonizers as helping to lay the foundations for later development, empire is usually seen as bad for the people that were colonized ([Ferguson 2003](#)). However, one of the most controversial debates in economic history concerns the costs and benefits of empire for the colonizers. It is easy to point to large fortunes accumulated by individual merchants through colonial investments, but there were costs as well as benefits to maintaining an empire. Retrospective cost-benefit analysis suggests that the colonial powers earned a social rate of return that was below the risk-free rate ([Davis and Huttenback 1986](#)). In other words, they would have reaped a higher rate of return by holding government bonds. Why, then, were the empires held? It is important to remember that the benefits were concentrated in the hands of a few, who were able to mobilize and influence governments, whereas the costs were spread across all taxpayers, who were less able to mobilize effectively.

Concluding Comments

This book provides an overview of the modern world economy from around 1700 to 1870, focusing on the issues of economic growth and development. We examine the beginnings of modern economic growth, giving due weight to chronology, regional balance, and coverage of the main factors governing differential outcomes in different parts of the global economy.

Part I on regional developments covers the first emergence of modern economic growth in eighteenth-century Britain, and follows its spread to

other parts of the world. The forging ahead of economies making the transition to modern economic growth led to reversals of fortune within and between continents. Within Europe, the first transition to modern economic growth in Britain led to a reversal of fortunes between the North Sea area and the Mediterranean region. The drive of Japan towards modern economic growth during the Tokugawa Shogunate, combined with declining per capita incomes in Qing dynasty China, led to a reversal of fortunes within Asia. A reversal of fortunes also occurred within the Americas between North America and Latin America.

Part II on the factors governing differential outcomes covers both the proximate and ultimate sources of growth. Dealing first with the proximate factors, investment in physical and human capital and the development of better technology undoubtedly played an important role. However, they can only tell us how rather than why the transition to modern economic growth occurred. To get at the ultimate sources of growth, we need to examine the roles of geography and institutions. First nature geography has always been seen as playing a role in the location of the Industrial Revolution in Britain and its spread to other parts of the world through the location of coal. However, recent work has also highlighted the role of second nature geography through agglomeration economies and access to nearby buoyant markets. Institutions matter because they provide the incentives for socially productive activities such as trade, investment and innovation.

References

- Allen, R. C. (2009). *The British Industrial Revolution in Global Perspective*, Cambridge University Press.
- Allen, R. C., Murphy, T. E. and Schneider, E. B. (2012). 'The Colonial Origins of Divergence in the Americas: A Labor Market Approach', *Journal of Economic History*, 72, 863–94.
- Álvarez-Nogal, C. and Prados de la Escosura, L. (2013). 'The Rise and Fall of Spain (1270–1850)', *Economic History Review*, 66, 1–37.
- Arroyo Abad, L. and van Zanden, J. L. (2016). 'Growth under Extractive Institutions? Latin American per capita GDP in Colonial Times', *Journal of Economic History*, 76, 1182–1215.
- Bassino, J.-P., Broadberry, S., Fukao, K., Gupta, B. and Takashima, M. (2019). 'Japan and the Great Divergence, 730–1870', *Explorations in Economic History*, 72, 1–22.
- Bolt, J. and van Zanden, J. L. (2014). 'The Maddison Project: Collaborative Research on Historical National Accounts', *Economic History Review*, 67, 627–651.
- Broadberry, S. (2003). 'Relative per Capita Income Levels in the United Kingdom and the United States since 1870: Reconciling Time-Series Projections and Direct-Benchmark Estimates', *Journal of Economic History*, 63, 852–863.

- (2013). 'Accounting for the Great Divergence', LSE Economic History Working Papers, No. 184/2013, <http://eprints.lse.ac.uk/54573/1/WP184.pdf>.
- Broadberry, S. and Irwin, D. (2006). 'Labor Productivity in the United States and the United Kingdom During the Nineteenth Century', *Explorations in Economic History*, 43, 257–279.
- Broadberry, S. and Wallis, J. (2017). 'Growing, Shrinking and Long Run Economic Performance: Historical Perspectives on Economic Development', National Bureau of Economic Research Working Paper No. 23343, www.nber.org/papers/w23343 (accessed 29 September 2020).
- Broadberry, S., Campbell, B., Klein, A., Overton, M. and van Leeuwen, B. (2015a). *British Economic Growth, 1270–1870*, Cambridge University Press.
- Broadberry, S., Custodis, J. and Gupta, B. (2015b). 'India and the Great Divergence: An Anglo-Indian Comparison of GDP per capita, 1600–1871', *Explorations in Economic History*, 55, 58–75.
- Broadberry, S., Guan, H. and Li, D. (2018). 'China, Europe and the Great Divergence: A Study in Historical National Accounting', *Journal of Economic History*, 78, 955–1000.
- Buyst, E. (2011). 'Towards Estimates of Long Term Growth in the Southern Low Countries, ca.1500–1846', paper for the 'Quantifying Long Run Economic Development' conference at the University of Warwick in Venice, March 22–24, www.warwick.ac.uk/fac/soc/economics/events/seminars-workshops-conferences/conferences/venice3/programme/buyst.pdf (accessed 29 September 2020).
- Clark, G. (2007). *A Farewell to Alms: A Brief Economic History of the World*, Princeton University Press.
- Crafts, N. F. R. and Venables, A. J. (2003). 'Globalization in History: A Geographical Perspective', in Bordo, M., Taylor, A. M. and Williamson, J. G. (eds.), *Globalization in Historical Perspective*, Chicago: Chicago University Press, 323–364.
- Davis, L. E. and Huttenback, R. A. (1986). *Mammon and the Pursuit of Empire: The Political Economy of British Imperialism, 1860–1912*, New York: Cambridge University Press.
- Engerman, S. L. and Sokoloff, K. L. (1997). 'Factor Endowments, Institutions, and Differential Paths of Growth Among New World Economies: A View from Economic Historians of the United States', in Haber, S. (ed.), *How Latin America Fell Behind: Essays on the Economic History of Brazil and Mexico, 1800–1914*, Stanford University Press, 260–304.
- Ferguson, N. (2003). *Empire: How Britain made the Modern World*, London: Allen Lane.
- Fourie, J. and van Zanden, J. L. (2013). 'GDP in the Dutch Cape Colony: The National Accounts of a Slave-Based Society', *South African Journal of Economics*, 81, 467–490.
- Galor, O. (2005). 'From Stagnation to Growth: Unified Growth Theory', in Aghion, P. and Durlauf, S. N. (eds.), *Handbook of Economic Growth, Volume 1A*, Amsterdam: Elsevier, 171–285.
- Geloso, V. (2015). 'The Seeds of Divergence: The Economy of French America, 1688 to 1760', Unpublished PhD thesis, London School of Economics and Political Science, etheses.lse.ac.uk/3442/1/Geloso_seeds_of_divergence.pdf.
- Haines, M. R. (2006). 'Population Characteristics', in Historical Statistics of the United States Database, hsus.cambridge.org/HSUSWeb/HSUSEntryServlet.
- Krantz, O. (2017). 'Swedish GDP 1300–1560: A Tentative Estimate', Lund Papers in Economic History; No. 152, Department of Economic History, Lund University.

- Krugman, P. and Venables, A. (1995). 'Globalization and the Inequality of Nations', *Quarterly Journal of Economics*, 110, 857–880.
- Landes, D. S. (1969). *The Unbound Prometheus. Technological Change and Industrial Development in Western Europe from 1750 to the Present*, Cambridge University Press.
- (1998). *The Wealth and Poverty of Nations: Why Some are So Rich and Some So Poor*, London: Little, Brown.
- Li, B. and van Zanden, J. L. (2012). 'Before the Great Divergence? Comparing the Yangzi Delta and the Netherlands at the Beginning of the Nineteenth Century', *Journal of Economic History*, 72, 956–989.
- Lindert, P. H. and Williamson, J. G. (2016). *Unequal Gains: American Growth and Inequality since 1700*, Princeton University Press.
- Maddison, A. (2001). *The World Economy: A Millennial Perspective*, Paris: Organisation for Economic Co-operation and Development.
- (2010). 'Statistics on World Population, GDP and Per Capita GDP, 1–2008 AD', Groningen Growth and Development Centre, www.ggdc.net/MADDISON/oriindex.htm (accessed 29 September 2020).
- Malanima, P. (2011). 'The Long Decline of a Leading Economy: GDP in Central and Northern Italy, 1300–1913', *European Review of Economic History*, 15, 169–219.
- Malinowski, M. and van Zanden, J. L. (2017). 'Income and its Distribution in Pre-Industrial Poland', *Cliometrica*, 11, 375–404.
- Mancall, P. C. and Weiss, T. (1999). 'Was Economic Growth Likely in Colonial British North America?', *Journal of Economic History*, 59(1), 17–40.
- North, D. C. (1990). *Institutions, Institutional Change, and Economic Performance*, Cambridge University Press.
- North, D. C. and Thomas, R. P. (1973). *The Rise of the Western World: A New Economic History*, Cambridge University Press.
- O'Rourke, K. H. and Williamson, J. G. (2002). 'When did Globalisation Begin?', *European Review of Economic History*, 6, 23–50.
- Palma, N. and Reis, J. (2017). 'From Convergence to Divergence: Portuguese Economic Growth, 1527–1850', Unpublished manuscript, University of Manchester.
- Pamuk, S. (2006). 'Estimating Economic Growth in the Middle East since 1820', *Journal of Economic History*, 66, 809–828.
- (2009). 'Estimating GDP per capita for the Ottoman Empire in a European Comparative Framework, 1500–1820', paper presented at the XVth World Economic History Congress, August 2009, Utrecht.
- Pfister, U. (2011). 'Economic Growth in Germany, 1500–1850', paper for the 'Quantifying Long Run Economic Development' conference at the University of Warwick in Venice, March 22–24, warwick.ac.uk/fac/soc/economics/seminars/seminars/conferences/venice3/programme/pfister_growth_venice_2011.pdf (accessed 5 October 2020).
- Pirenne, H. (1936). *Economic and Social History of Medieval Europe*, London: Routledge & Kegan Paul.
- Pomeranz, K. (2000). *The Great Divergence: China, Europe, and the Making of the Modern World Economy*, Princeton University Press.
- (2011). 'Ten Years After: Responses and Reconsiderations', *Historically Speaking*, 12(4), 20–25. Project Muse.

- (2017). 'The Data We Have vs. the Data We Need: A Comment on the State of the "Divergence" Debate (Part I)', The NEP-HIS Blog, nephist.wordpress.com/2017/06/06/the-data-we-have-vs-the-data-we-need-a-comment-on-the-state-of-the-divergence-debate-parti/#comments">nephist.wordpress.com">nephist.wordpress.com/2017/06/06/the-data-we-have-vs-the-data-we-need-a-comment-on-the-state-of-the-divergence-debate-parti/#comments (accessed 5 October 2020).
- Prados de la Escosura, L. (2000). 'International Comparisons of Real Product, 1820–1990', *Explorations in Economic History*, 37, 1–41.
- Ridolfi, L. (2016). 'The French Economy in the Longue Durée. A Study on Real Wages, Working Days and Economic Performance from Louis IX to the Revolution (1250–1789)', Unpublished PhD thesis, IMT School for Advanced Studies, Lucca.
- Schön, L. and Krantz, O. (2012). 'The Swedish Economy in the Early Modern Period: Constructing Historical National Accounts', *European Review of Economic History*, 16, 529–549.
- Solow, R. (1957). 'Technical Change and the Aggregate Production Function', *Review of Economics and Statistics*, 39, 312–320.
- Sutch, R. (2006). 'National Income and Product', in Historical Statistics of the United States Database, hsus.cambridge.org/HSUSWeb/HSUEntryServlet (accessed 29 September 2020).
- Ubelaker, D. H. (1992). 'North American Indian Population Size: Changing Perspectives', in Verano, J. W. and Ubelaker, D. H. (eds.), *Disease and Demography in the Americas*, Washington, DC: Smithsonian Institution Press, 169–176.
- United Nations Development Program [UNDP] (1990). World Development Report, Oxford University Press.
- Ward, M. and Devereux, J. (2003). 'Measuring British Decline: Direct Versus Long-Span Income Measures', *Journal of Economic History*, 63, 826–851.
- Weber, M. (1930). *The Protestant Ethic and the Spirit of Capitalism*. London: Allen & Unwin.
- van Zanden, J. L. (2012). 'Economic Growth in Java 1815–1939: The Reconstruction of the Historical National Accounts of a Colonial Economy', Maddison-Project Working Paper WP–3, www.rug.nl/ggdc/historicaldevelopment/maddison/publications/wp3.pdf (accessed 29 September 2020).
- van Zanden, J. L. and van Leeuwen, B. (2012). 'Persistent but not Consistent: The Growth of National Income in Holland, 1347–1807', *Explorations in Economic History*, 49, 119–130.

PART I

★

REGIONAL DEVELOPMENTS

Britain, the Industrial Revolution, and Modern Economic Growth

STEPHEN BROADBERRY

Introduction

Economic historians have traditionally seen the Industrial Revolution as marking the beginning of the modern world. Early work in the subject tended to see living standards before the Industrial Revolution as uniformly low, with little if any progress from the ancient world through the medieval period to the early modern era. The transition to modern economic growth was characterized as occurring first in Britain from the mid-eighteenth century, with the Industrial Revolution initiating an increase in the rate of growth of population and production, but with production growth outstripping population growth. Eventually population growth slowed down as the economy went through a demographic transition, but output per head continued to grow and even accelerated from the late nineteenth century. For the first time, it seemed that a society was able to improve the material living standards of virtually all of its members, rather than just a small elite.

A new generation of researchers has challenged aspects of this simple account, but without dethroning the British Industrial Revolution from its central role in the transition to modern economic growth. First, new estimates of gross domestic product (GDP) per head show that there were several episodes of pre-industrial growth in Britain, interspersed with episodes of stagnation rather than decline, so that the Industrial Revolution built upon prior developments. Second, international comparisons have clarified the extent to which the Industrial Revolution was a purely British phenomenon, placing it within the context of both a Little Divergence within Europe and a Great Divergence between Europe and Asia. Third, with long time series of output and population, researchers have questioned the extent to which the pre-industrial economy conformed to the Malthusian model.

Fourth, new work on real wages in Britain and a wide range of European and Asian economies has established that living standards were not uniformly low before the mid-eighteenth century, but rather that the Industrial Revolution occurred in Britain at least partly in response to high wages, which stimulated the substitution of capital for labour, the accumulation of human capital and labour-saving changes in technology.

British Economic Performance, 1700–1870

British Economic Growth in Long Run Perspective

Although there has been broad agreement about the quantitative dimensions of British economic growth during the period 1700–1870 since the work of [Crafts and Harley \(1992\)](#), recent work by [Broadberry et al. \(2015\)](#) sheds new light on this work by providing historical national accounts for Britain reaching back to the late thirteenth century. An important result of the Crafts-Harley work was to demonstrate that economic growth during the Industrial Revolution was much slower than had originally been suggested by [Deane and Cole \(1967\)](#). This meant that Britain must have entered the Industrial Revolution already richer and more developed than earlier economic historians had assumed. To understand Britain's transition to modern economic growth, it is therefore necessary to examine what happened further back in time.

[Broadberry et al. \(2015\)](#) reconstruct the path of GDP for Britain from series for the output of the agricultural, industrial and service sectors, combined with a set of sectoral weights that capture the changing structure of the economy. To estimate GDP per head, this aggregate GDP series is divided by population. [Figure 1.1](#) shows the long run evolution of real GDP, population and real GDP per head over the long period 1270–1870. GDP per head stagnated during 1270–1348, before increasing sharply between 1348 and 1400, as population declined more sharply than GDP following the shock of the Black Death. GDP per head then remained on a plateau between c.1400 and 1650 as population at first continued to fall and then began to recover from the late fifteenth century. A new GDP per head growth phase started around 1650, as population stagnated and then declined slightly. Although GDP per head growth slowed down after 1700 as population growth resumed, it remained positive and became increasingly stable, with fewer and fewer years of negative GDP per head growth. It seems, then, that the Industrial Revolution was more about shrinking less frequently than about growing faster ([Broadberry and Wallis 2017](#)).

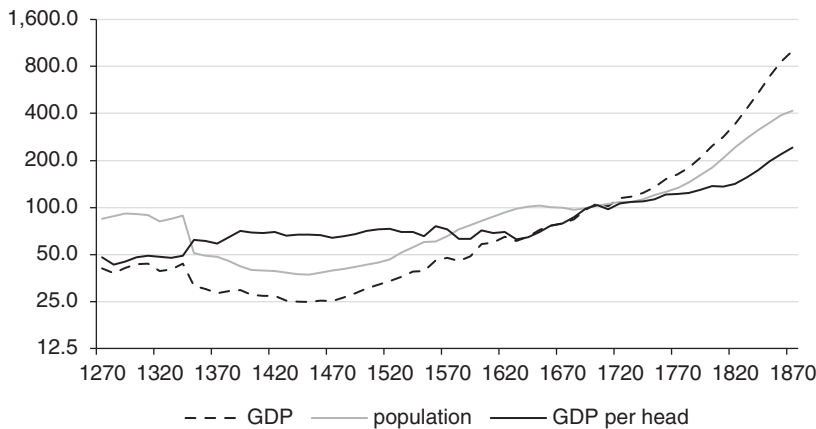


Figure 1.1 Real GDP, population, and real GDP per head, England 1270–1700 and Great Britain 1700–1870 (averages per decade, log scale, 1700 = 100)

Source: Broadberry et al. (2015; 2024).

Table 1.1 presents the average annual growth rates for the same three series: GDP, population and GDP per head. Notice how the growth rate of GDP per head after 1800 was actually slightly slower than after the Black Death (1350s–1400s) and after the Civil War (1650s–1700), despite the fact that GDP growth was much faster. The reason for this was the very different paths of population in these three periods. Whereas population declined very sharply after the Black Death, and still declined slightly after the Civil War, it grew very rapidly during the first two-thirds of the nineteenth century. This points to a major difference between modern economic growth and pre-industrial growth, as highlighted by Kuznets (1966). Pre-industrial growth required falling population, and this led to an increase in land per head and capital per head, which in turn led to higher output per head. However, this was clearly not a route to sustained growth. For Kuznets, sustained or modern economic growth required rising output per head together with a growing population.

Structural Change in Britain

Another important aspect of modern economic growth is structural change. It has long been noted that economic development is associated with a shift in the structure of the economy away from dependence on agriculture. This has traditionally been seen as a process of industrialization, although recent research suggests that this understates the role of services. Broadberry et al.

Table 1.1 Annual growth rates of real GDP, population, and real GDP per head, Great Britain 1700–1870 (percentage)

	Real GDP	Population	Real GDP per head
A. England			
1270s–1300s	−0.02	0.27	−0.29
1300s–1350s	−0.64	−0.52	−0.12
1350s–1400s	−0.30	−1.06	0.76
1400s–1450s	−0.06	−0.21	0.15
1450s–1500s	0.40	0.25	0.15
1500s–1550s	0.51	0.65	−0.14
1550s–1600s	0.81	0.62	0.19
1600s–1650s	0.41	0.51	−0.10
1650s–1700	0.78	−0.04	0.82
1270s–1700	0.22	0.04	0.18
B. Great Britain			
1700–1750s	0.49	0.30	0.19
1750s–1800s	1.21	0.77	0.44
1800s–1850s	2.08	1.34	0.74
1850s–1870	0.12	1.54	0.58
1700–1870	1.31	0.84	0.48

Source: Broadberry et al. (2015: 208).

(2015) note that the British economy diversified away from agriculture over a longer time span than was once believed by economic historians. Agriculture was less important and services more important earlier than widely perceived, with important consequences for sectoral productivity performance. Labour productivity growth was faster in industry than in agriculture during the Industrial Revolution rather than the reverse, as early quantification of the Industrial Revolution had appeared to suggest.

The quantitative dimensions of the structural shift away from agriculture in the British economy are set out in Table 1.2. The first point to note is that agriculture's share of output and employment declined in importance over time, while the shares of industry and services increased, as would be expected for a developing nation. Second, however, note that even as early as 1381, agriculture accounted for less than 60 per cent of employment and less than 50 per cent of nominal GDP, so that even in the fourteenth century, industry and services accounted for a substantial share of economic activity. Third, although agriculture accounted for a smaller share of output than employment for most of the period under consideration here, thus making

Table 1.2 Sectoral shares in nominal GDP and the labour force, England 1381–1700 and Great Britain 1700–1870 (percentage)

A. Nominal GDP shares

Year	Region	Agriculture	Industry	Services	Total
1381	England	45.5	28.8	25.7	100.0
1522	England	39.7	38.7	21.6	100.0
1700	England and Britain	26.7	41.3	32.0	100.0
1759	Britain	29.7	35.2	35.1	100.0
1801	Britain	31.3	32.7	36.0	100.0
1841	Britain	22.1	36.4	41.5	100.0

B. Labour force shares

Year	Region	Agriculture	Industry	Services	Total
1381	England	57.2	19.2	23.6	100.0
1522	England	58.1	22.7	19.2	100.0
1700	England and Britain	38.9	34.0	27.2	100.0
1759	Britain	36.8	33.9	29.3	100.0
1801	Britain	31.7	36.4	31.9	100.0
1841	Britain	23.5	45.6	30.9	100.0

Source: Broadberry et al. (2015: 344).

agriculture a low productivity sector, this had ceased to be the case by 1801, a point first noted by Crafts (1985). Fourth, although industry increased its share of nominal GDP more rapidly than services until 1700, this ceased to be the case during the Industrial Revolution period. This may at first sight seem surprising but can be explained by a decline in the relative price of industrial goods, as technological progress increased productivity and drove down prices. By contrast, the more modest productivity improvement in services led to an increase in their relative price, so that the share of services in nominal GDP increased more rapidly than the share of industry after 1700.

A fifth striking feature of Table 1.2 is that much of the shift of labour from agriculture to industry occurred before 1759, which has important implications for the pattern of labour productivity growth before and during the Industrial Revolution. If, as was once believed, the shift of labour from agriculture to industry had taken place at the same time as the Industrial Revolution, then much of the growth of industrial output could be explained by increased labour input rather than by productivity growth. This counter-intuitive result

Table 1.3 Sectoral annual growth rates of output, labour force, and labour productivity, England 1381–1700 and Great Britain 1700–1851

Period	Annual % growth:					
	Agriculture			Industry		
	Output	Labour force	Labour productivity	Output	Labour force	Labour productivity
1381–1522	0.01	−0.01	0.02	0.27	0.10	0.17
1522–1700	0.38	0.25	0.13	0.73	0.66	0.07
1700–59	0.79	0.22	0.57	0.63	0.31	0.32
1759–1801	0.85	0.44	0.41	1.54	0.97	0.57
1801–51	0.74	0.64	0.10	3.00	1.74	1.23
1381–1759	0.30	0.13	0.17	0.54	0.40	0.14
1759–1851	0.79	0.54	0.24	2.33	1.39	0.93
	Services			GDP		
	Output	Labour force	Labour productivity	Output	Labour force	Labour productivity
1381–1522	0.06	−0.16	0.23	0.11	−0.02	0.14
1522–1700	0.74	0.60	0.14	0.60	0.45	0.16
1700–59	0.70	0.44	0.26	0.69	0.32	0.38
1759–1801	1.36	1.00	0.36	1.23	0.79	0.44
1801–51	2.16	1.45	0.71	2.10	1.35	0.74
1381–1759	0.48	0.31	0.17	0.43	0.25	0.18
1759–1851	1.80	1.24	0.55	1.70	1.09	0.60

Source: Broadberry et al. (2015: 367).

was implicit in the work of Deane and Cole (1967), and also confronted more explicitly by Crafts and Harley (1992). With much of the shift of labour from agriculture to industry occurring between 1522 and 1759, there was a period of labour-intensive industrialization (or proto-industrialization) without dramatic industrial productivity growth, which can be tracked in Table 1.3. This was then followed by the Industrial Revolution, where capital deepening and technological progress raised industrial labour productivity rapidly after 1759.

Britain in the Global Economy

Britain's rise to income leadership can be seen as part of a Little Divergence within Europe as the North Sea area economies of Britain and the Netherlands overtook the Mediterranean economies of Italy and Spain. This occurred in parallel with a Little Divergence within Asia as Japan

Table 1.4 Levels of GDP per head in Europe and Asia (1990 international dollars)

	GB	NL	Italy	Spain	Japan	China	India
1300	724	674	1,466	889	531	833	
1400	1,045	958	1,570	822	548	991	
1500	1,068	1,141	1,408	826	548	852	
1600	1,077	1,825	1,224	876	667	859	682
1650	1,055	1,671	1,372	838	667	859	638
1700	1,563	1,849	1,344	817	676	1,089	622
1750	1,710	1,877	1,446	845	752	749	573
1800	2,080	1,974	1,327	893	828	654	569
1850	2,997	2,397	1,306	1,144	904	600	556

Source: [Broadberry et al. \(2018\)](#).

overtook China. The Great Divergence between the two continents was the net result of these regional developments within both Europe and Asia, as north-west Europe forged ahead of the rest of Europe and Asia.

These developments are shown in [Table 1.4](#), where levels of GDP per head are shown in a common unit, 1990 international dollars, so that average living standards can be compared across both space and time. The Little Divergence within Europe can be seen in the first four columns of [Table 1.4](#). In 1300, GDP per head was higher in Italy and Spain, reflecting the dominant position of the Mediterranean region in the European economy. After 1500, however, with the opening of new trade routes between Europe and Asia around the south of Africa and between Europe and the New World across the Atlantic, the Mediterranean lost its role as the centre of economic activity in Europe. In these changed circumstances, access to the Atlantic became more important, and the North Sea area economies of the Netherlands and Britain became the leading European economies. The Netherlands was the first north-west European economy to forge ahead during its Golden Age between 1570 and 1650, but Great Britain grew more rapidly after 1650 and ultimately emerged as the first economy to achieve modern economic growth, with sustained growth of GDP per head accompanied by rapid population growth.

Within Asia, another Little Divergence was occurring as Japan forged ahead of China in the eighteenth century. Although Japan experienced positive growth during the sixteenth century, and again in the eighteenth

and nineteenth centuries under the Tokugawa Shogunate, growth was slower than in Britain, so that Japan's rise to economic leadership within Asia depended also on the decline of GDP per head that occurred in Qing dynasty China during the eighteenth century. Japan achieved modern economic growth after the Meiji Restoration of 1868, but until then the slower rate of growth in the leading Asian economy compared to the leading parts of Europe meant that the gap in living standards between the two continents continued to widen in the phenomenon known as the Great Divergence.

Accounting for British Economic Growth: Proximate Sources

Growth accounting helps us to assess whether economic growth came from the use of more factor inputs or from the more effective use of existing inputs. In the simplest formulation, as set out in the Introduction to this volume, the growth rate of output can be related to the growth rates of the inputs of capital and labour and the growth rate of total factor productivity. Each factor is weighted by its share of national income, which is wages in the case of labour and profits in the case of capital.

Growth Accounting with Physical Capital and Raw Labour

Crafts and Harley (1992) conducted a growth accounting exercise for Great Britain in the period 1700–1860 using this simple two-factor approach, based on their own estimates of output growth, the growth of population from Wrigley and Schofield (1981) as the labour input, and Feinstein's (1988) capital stock data. Crafts and Harley's estimates, reproduced here in Table 1.5, show that about two-thirds of the increase in output growth from 0.70 per cent during 1700–1760 to 2.5 per cent during 1831–1860 was due to faster growth of factor inputs, and only one-third due to faster growth of total factor productivity (TFP). McCloskey's (1981: 108) claim that 'ingenuity rather than abstention governed the industrial revolution' does not seem to be borne out by this simple exercise in growth accounting. Rather than being the result of ingenious new ways of combining inputs (hence raising TFP growth), higher output growth seems to have been due primarily to abstention from leisure (hence more labour inputs) and abstention from consumption (hence more savings to invest in capital inputs). Furthermore, a good part of the increased input growth was due to labour rather than capital, as a result of the rapid rate of population growth, hence leading to a relatively modest rate of

growth of GDP per head. And to the extent that TFP growth did increase, it was largely delayed until after 1830.

Growth Accounting with Human Capital

In a more sophisticated formulation of growth accounting, a distinction can be made between skilled and unskilled labour, so that there are three factors of production, including human capital as well as physical capital and raw labour. [Crafts \(1995\)](#) conducted a growth accounting exercise on this basis for Great Britain in the period 1760–1913, shown here in [Table 1.6](#). Human capital seems not to have been very important during the early stages of the Industrial Revolution, with literacy rates stagnating during the second half of the eighteenth century ([Schofield 1973](#)). Although the periodization is slightly different between [Tables 1.5](#) and [1.6](#), it is nevertheless clear that the inclusion of human capital results in even lower rates of TFP growth during the Industrial Revolution than in the simple two-factor growth accounting exercise. This strengthens the finding that the increase in output growth owed more to the faster growth of factor inputs than to greater efficiency in their use.

The ‘Industrious Revolution’ and the Labour Input

The growth accounting exercise in [Table 1.5](#) assumes that the labour input grew in line with population. However, this assumes that the number of days worked per year remained unchanged, which has always been disputed by those who see the Industrial Revolution as leading to an intensification of work effort, as people worked harder to obtain the new goods made available by long-distance trade and new technology ([de Vries 1994](#)). Although

Table 1.5 Accounting for British GDP growth, 1700–1860, two-factor model (percentage per annum)

	Output growth	Due to capital	Due to labour	TFP growth
1700–60	0.70	0.35	0.15	0.20
1760–1801	1.00	0.50	0.40	0.10
1801–31	1.90	0.85	0.70	0.35
1831–60	2.50	1.00	0.70	0.80

Sources and notes: Derived from [Crafts \(1985: 81\)](#); [Crafts and Harley \(1992: 718\)](#); [Harley \(1993: 198\)](#). All calculations are on a two-factor basis, with capital and labour weighted equally.

Table 1.6 Accounting for British GDP growth, 1760–1913, three-factor model (percentage per annum)

	Output growth	Due to capital	Due to labour	Due to human capital	TFP growth
1760–80	0.60	0.25	0.20	0.10	0.05
1780–1831	1.70	0.60	0.45	0.45	0.20
1831–73	2.40	0.90	0.45	0.70	0.35
1873–99	2.10	0.80	0.30	0.50	0.50
1899–1913	1.40	0.80	0.30	0.50	–0.20

Sources and notes: [Crafts \(1995: 752\)](#). Weights are 0.4 for capital, 0.35 for labour and 0.25 for human capital.

evidence for the idea of an ‘industrious revolution’ initially proved elusive, quantitative information has recently emerged to suggest that it played quite an important role. [Voth \(2001\)](#) uses court records from London and the north of England to infer the decline of the pre-industrial practice of not working on Mondays (known colloquially as St Monday). His estimates suggest that annual hours worked per person increased from 2,576 in 1760 to 3,328 by 1800 and 3,356 by 1830, so that labour input grew at an annual rate of 1.4 per cent between 1760 and 1801, rather than at the 0.8 per cent rate suggested by population growth. This would reduce TFP growth during this period by 0.3 per cent per year, which would be sufficient to make TFP growth slightly negative rather than positive for the period 1760–1801 in [Table 1.5](#). Abstinence rather than ingenuity seems to have governed the Industrial Revolution by a considerably greater margin than contemplated even by [Crafts and Harley \(1992\)](#), let alone by [McCloskey \(1981\)](#).

The idea of a significant increase in annual working hours during the Industrial Revolution has recently received further quantitative support from [Humphries and Weisdorf \(2016\)](#), who contrast the real wages of workers employed on annual contracts with those of workers paid on daily rates. The difference between the two series can be taken as representing the change in the number of days worked per year. The path of real wages shown by their ‘annual’ series tracks quite closely the path of real GDP per head as estimated by [Broadberry et al. \(2015\)](#), and is thus consistent with their claim that the daily real wage series can be reconciled with the GDP per head data during the period 1700–1870 largely through an increase in days worked per year, with smaller contributions from a reduction in the share of GDP going to labour and an increase in the relative price of food. The number of days

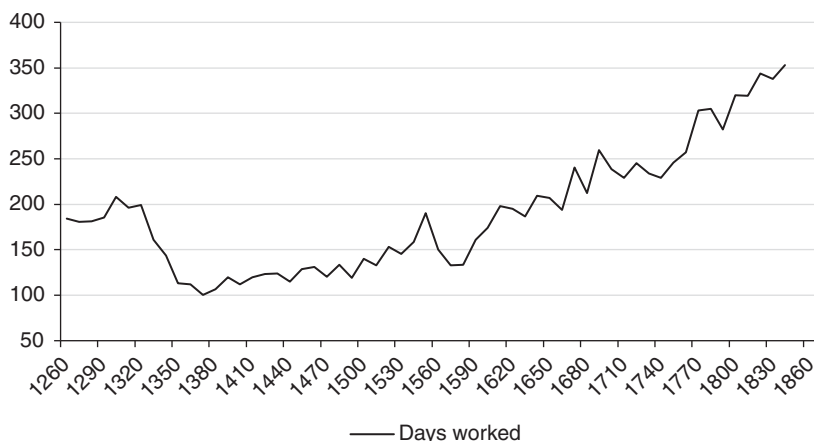


Figure 1.2 The implied working year of day workers, 1260s–1840s
Source: [Humphries and Weisdorf \(2016\)](#).

worked per year implied by the Humphries and Weisdorf data over the period from the 1260s to the 1840s is shown in [Figure 1.2](#).

The Role of Technology

Growth accounting was introduced by [Solow \(1957\)](#) and is often associated with his one-sector neoclassical growth model, in which total factor productivity growth is treated as an exogenous variable and equated with technological progress ([Solow 1956](#)). In fact, this is not strictly necessary and [Barro \(1999\)](#) shows within a growth accounting framework how TFP growth can be seen as reflecting endogenous technological progress or spillover effects from accumulation. These findings were anticipated by [Crafts \(1995\)](#) in an early attempt to reconsider the Industrial Revolution in the light of endogenous growth theory. The strongest result of [Crafts \(1995: 754\)](#) was that spillover effects from accumulation were unlikely to have played a major role in the British Industrial Revolution, since Britain was characterized by relatively low rates of investment in both physical and human capital. [Crafts \(1995: 761–767\)](#) thus saw the endogenization of innovation as a more promising line of enquiry, but pointed to relatively low levels of spending on research and development compared with later periods, and placed more emphasis on wider growth-promoting characteristics of British society such as incentives for wealth creation rather than rent-seeking, a low share of direct taxes in overall taxes and high rates of urbanization.

The Industrial Revolution is rightly remembered as a period of innovation in manufacturing. Museums continue to celebrate the spinning jenny, the water frame, the mule and the power loom in cotton textiles, coke smelting and the reverberatory furnace in iron, and the use of the steam engine to power machinery across all branches of manufacturing. However, it is worth bearing in mind that the first industrial use of the steam engine occurred in mining, and that it soon spread beyond industry to the agricultural and service sectors. Indeed, some of the most important applications of the steam engine lay in transport, with the development of the steam locomotive on the railways revolutionizing inland transport and the steamship having a similar effect on overseas transport.

Recent work by [Allen \(2009\)](#) and [Mokyr \(2009\)](#) has sought to place technological progress at the heart of explaining the Industrial Revolution, but with quite different emphases. Whereas [Allen \(2009\)](#) sees technological progress in Britain as a response to a unique set of factor prices, [Mokyr \(2009\)](#) emphasizes a wider ‘industrial enlightenment’. Before examining these two approaches in detail, however, it is worth emphasizing once again the key result of this section, which has established that growth of factor inputs accounted for two-thirds of the increase in the rate of output growth, leaving the other third to be explained by TFP growth, which includes all other efficiency gains as well as technological progress.

Explaining the Industrial Revolution and the Transition to Modern Economic Growth

Growth accounting is useful in identifying the proximate sources of growth, but cannot really explain why the Industrial Revolution occurred in Britain rather than elsewhere. If an industrious revolution and capital accumulation were the proximate sources, why did they happen in Britain rather than in France or the Netherlands? And to the extent that technological progress was responsible, why again did the key innovations occur in Britain? In this section we therefore turn to the more fundamental causes of economic growth. Economists tend to divide the fundamental causes of economic growth into two categories: geography and institutions.

Geography

Economic geographers make an important distinction between first nature and second nature geography. First nature geography covers natural endowments such as mineral deposits or climate, while second nature geography

covers man-made factors such as access to markets and agglomeration economies. Allen (2009) emphasizes both aspects of economic geography in his explanation of Britain's primacy during the Industrial Revolution. First nature geography played an important role because of Britain's large reserves of coal. However, it is clear that this would not be sufficient on its own, since the coal deposits were always there and did not suddenly materialize during the eighteenth century. Rather, their utilization depended on a number of factors that can be seen as reflecting second nature geography. Allen places particular emphasis on the growth of London, which stimulated the coal industry in the north of England to satisfy London's growing demand for fuel as wood became scarce and was increasingly replaced by coal shipped from Newcastle. This resulted in the first element of what Allen sees as Britain's unique factor-price combination of low coal prices and high wages. The high wages resulted from agglomeration economies associated with the growth of London, combined with the effects of Britain's growing success in international trade, following the shift of Europe's trading focus from the Mediterranean to the Atlantic from around 1500.

Allen sees the key innovations of the Industrial Revolution as a response to high wages and low coal prices in Britain, with the new technology characterized as labour-saving and coal-using. This framework is also useful in understanding why the key innovations of steam-driven machinery in industries such as cotton textiles, iron and engineering were not immediately adopted elsewhere, since they were designed to be profitable in the circumstances of Britain's unique factor-price combination. But Britain's advantage did not last forever, as further technological change adapted the new technologies to other factor-price combinations, and eventually made them dominate the old technologies over a much wider range of factor prices.

Institutions

Allen (2009) sees technological change as a response to the incentives faced by entrepreneurs, which can be seen ultimately as shaped by both first and second nature geography. Although Allen (2009: 4–5, 14–15, 125–126) explicitly seeks to distance himself from the idea of institutions playing an important role, it seems but a small step from the characterization of entrepreneurs as responding to factor-price incentives to a consideration of how individuals respond to the incentives provided by the 'rules of the game' embodied in the wider institutional framework (North 1990). North defined institutions as the rules of the game, both formal and informal, which define and limit the set of choices that individuals make. He saw institutions as

affecting economic performance by providing incentives for individuals to engage in socially productive activities such as exchange and production, invention and innovation, saving and investment. Although [North and Weingast \(1989\)](#) sought to ‘explain’ the Industrial Revolution as a response to the institutional changes introduced by the Glorious Revolution of 1688, the lag of around a century between the two developments makes it hard to draw a firm link between the ‘credible commitment’ supposedly secured by the constitutional settlement and the later economic development. To be convincing, a clearer link is needed between the institutional change and the innovations of the Industrial Revolution.

Like Allen, [Mokyr \(2009\)](#) places the explanation of a sustained acceleration in the rate of technological progress at the heart of understanding the Industrial Revolution. Unlike Allen, however, [Mokyr \(2009: 40\)](#) embeds his explanation firmly within the wider institutional framework, drawing on his idea of a European ‘industrial enlightenment’, with scientists, engineers and inventors engaged on a Baconian programme of research based on experimentation and scientific method, directed at solving practical problems to produce ‘useful knowledge’. In the British case, however, [Mokyr \(2009: 120\)](#) sees it as important that these scientists, engineers and inventors were able to engage with a supply of skilled craftsmen, which existed partly as a result of historical contingency from past industrial developments, and partly as a result of a flexible institution in the form of the apprenticeship system. [Mokyr \(2009: 63–78\)](#) also emphasizes the effects of the Enlightenment on the wider institutional structure of society, although this part of the argument, with its emphasis on ideology increasingly coming to dominate vested interests, is necessarily more speculative.

As [Crafts \(2011: 166\)](#) notes, although [Allen \(2009\)](#) and [Mokyr \(2009\)](#) see themselves as offering competing explanations of the Industrial Revolution, their arguments are not mutually exclusive and could indeed be characterized as complementary. It would not be unreasonable to see British innovators as responding to the factor-price combination that they faced within an environment shaped by the Enlightenment.

The Standard of Living

What were the consequences of the Industrial Revolution for the living standards of the British people? This has been a controversial issue that has divided economic historians for as long as the subject has been studied. To understand the enduring nature of this controversy, it is helpful to see a single