DISCUSSION PAPER SERIES

DP15936

Accounting for the Great Divergence: Recent Findings from Historical National Accounting

Stephen Broadberry

ECONOMIC HISTORY

CEPR

ISSN 0265-8003

Accounting for the Great Divergence: Recent Findings from Historical National Accounting

Stephen Broadberry

Discussion Paper DP15936
Published 17 March 2021
Submitted 17 March 2021

Centre for Economic Policy Research
33 Great Sutton Street, London EC1V 0DX, UK
Tel: +44 (0)20 7183 8801
www.cepr.org

Accounting for the Great Divergence: Recent Findings from Historical National Accounting

Abstract

As a result of recent work on historical national accounting, it is now possible to establish more firmly the timing of the Great Divergence of living standards between Europe and Asia in the eighteenth century. There was a European Little Divergence as Britain and the Netherlands overtook Italy and Spain, and an Asian Little Divergence as Japan overtook China and India. The Great Divergence occurred because Japan grew more slowly than Britain and the Netherlands starting from a lower level, and because of a strong negative growth trend in Qing dynasty China. A growth accounting framework is used to assess the contributions of labour, human and physical capital, land and total factor productivity. In addition to these proximate sources, the roles of institutions and geography are examined as the ultimate sources of the divergent growth patterns.

JEL Classification: N10, N30, N35, O10, O57

Keywords: Great Divergence, living standards, Measurement, explanation

Stephen Broadberry - stephen.broadberry@nuffield.ox.ac.uk
University of Oxford and CEPR

Acknowledgements
This paper began life as the Figuerola Lecture delivered at the Fundación Ramón Areces in Madrid, 22 October 2012. I gratefully acknowledge the financial assistance of the Leverhulme Trust (Reference Number F/00215AR) and the Collaborative Project HI-POD supported by the European Commission's 7th Framework Programme for Research, Contract Number SSH7-CT-2008-225342 for the underlying research, which was carried out jointly with Jean-Pascal Bassino, Bruce Campbell, Johann Custodis, Kyoji Fukao, Hanhui Guan, Bishnnupriya Gupta, Alexander Klein, David Daokui Li, Mark Overton, Masanori Takashima and Bas van Leeuwen. I am grateful to Bob Allen, Jean-Pascal Bassino, Bruce Campbell, Giovanni Federico, James Fenske, Leigh Gardner, Mark Koyama, Bas van Leeuwen, Debin Ma, Paolo Malanima, Ulrich Pfister, Leandro Prados de la Escosura, Jaime Reis, Tirthankar Roy, Osamu Saito, Joachim Voth, Jakob Weisdorf and seminar/conference participants at Abu Dhabi, Belgrade, Copenhagen, Kent, Kyoto, London (LSE), Odense, Osaka, Oxford, Perugia, Tampere, Telford (EHS), Tokyo (Hitotsubashi and Todai), Venice, Washington, Warwick and York for helpful comments and discussions.

ACCOUNTING FOR THE GREAT DIVERGENCE: RECENT FINDINGS FROM HISTORICAL NATIONAL ACCOUNTING

Stephen Broadberry
Nuffield College Oxford, CAGE and CEPR
stephen.broadberry@nuffield.ox.ac.uk

14 March 2021
File: Accounting Great Divergence Revised v4.doc

Abstract: As a result of recent work on historical national accounting, it is now possible to establish more firmly the timing of the Great Divergence of living standards between Europe and Asia in the eighteenth century. There was a European Little Divergence as Britain and the Netherlands overtook Italy and Spain, and an Asian Little Divergence as Japan overtook China and India. The Great Divergence occurred because Japan grew more slowly than Britain and the Netherlands starting from a lower level, and because of a strong negative growth trend in Qing dynasty China. A growth accounting framework is used to assess the contributions of labour, human and physical capital, land and total factor productivity. In addition to these proximate sources, the roles of institutions and geography are examined as the ultimate sources of the divergent growth patterns.

JEL classification: N10, N30, N35, O10, O57
Key words: Great Divergence; living standards; measurement; explanation

Acknowledgements: This paper began life as the Figuerola Lecture delivered at the Fundación Ramón Areces in Madrid, 22 October 2012. I gratefully acknowledge the financial assistance of the Leverhulme Trust (Reference Number F/00215AR) and the Collaborative Project HI-POD supported by the European Commission's 7th Framework Programme for Research, Contract Number SSH7-CT-2008-225342 for the underlying research, which was carried out jointly with Jean-Pascal Bassino, Bruce Campbell, Johann Custodis, Kyoji Fukao, Hanhui Guan, Bishnnupriya Gupta, Alexander Klein, David Daokui Li, Mark Overton, Masanori Takashima and Bas van Leeuwen. I am grateful to Bob Allen, Jean-Pascal Bassino, Bruce Campbell, Giovanni Federico, James Fenske, Leigh Gardner, Mark Koyama, Bas van Leeuwen, Debin Ma, Paolo Malanima, Ulrich Pfister, Leandro Prados de la Escosura, Jaime Reis, Tirthankar Roy, Osamu Saito, Joachim Voth, Jakob Weisdorf and seminar/conference participants at Abu Dhabi, Belgrade, Copenhagen, Kent, Kyoto, London (LSE), Odense, Osaka, Oxford, Perugia, Tampere, Telford (EHS), Tokyo (Hitotsubashi and Todai), Venice, Washington, Warwick and York for helpful comments and discussions.

I. INTRODUCTION

The debate over the Great Divergence of productivity and living standards between Europe and Asia has had a remarkable impact on the economic history profession. For much of the twentieth century, economic historians treated the Industrial Revolution as the culmination of a process of gradual improvement, beginning in the late middle ages and continuing through the early modern period (Weber,1930; Landes 1969; North and Thomas, 1971). As Europe transformed its institutions and accumulated capital, Asia stagnated and began to fall behind. The Industrial Revolution and nineteenth century colonialism were seen as accelerating this process of divergence, rather than regarded as its fundamental causes. Pomeranz (2000) questioned what he saw as the Eurocentric bias of this account, claiming that as late as 1800, the Yangzi Delta region of China was as developed as Britain and the Netherlands, the richest parts of Europe. Other parts of Asia were also characterised as equally developed at the end of the eighteenth century. This chimed with the work of Frank (1998) and other economic historians working in California, and became known as the California School. Parthasarathi (1998) has claimed parity of living standards with Britain for South India during the late eighteenth century, while Hanley (1983) has argued for high living standards in nineteenth century Japan.

However, despite the fundamentally quantitative nature of the revisionist claims being made, this work was not generally based on systematic analysis of data. Whilst this was understandable given the past focus of quantitative economic history on the modern period, and particularly the period since the mid-nineteenth century, the new century has seen much progress in the extension of the quantitative approach both back in time and across space to cover Asia as well as Europe, and this paper draws on this work to provide an account of the Great Divergence. The word “accounting” is used here in two ways, embracing both measurement and explanation. The firmest conclusions will be in the area of measurement, because that is where most progress has been made recently, but there have also been advances in understanding the explanatory factors leading to the Great Divergence.

This paper argues that the revisionist authors of the California School were right to point to regional variation in economic performance in both Europe and Asia, but went too far in claiming parity of economic performance between the two continents until the nineteenth century. The historical national accounting data presented in this paper suggest that the Great Divergence dates from the eighteenth rather than the nineteenth century, a view that has recently been endorsed by Pomeranz (2011; 2017). However, this is obviously a lot later than suggested in the traditional view, where Europe was seen as forging ahead since at least 1500, if not as early as 1300.

As well as quantifying the timing of the Great Divergence in terms of GDP per capita comparisons, this paper also offers an account of the Great Divergence, in the sense of explanation. Drawing on Maddison's (1988) distinction between proximate and ultimate sources of growth, the first step is to assess the contributions of the proximate factors. These include the growth of the labour force, increased labour effort, investment in both human capital and physical capital, the growth of total factor productivity (TFP) and structural change. Because there has so far been rather less progress in the measurement of these variables than in the construction of GDP estimates, conclusions here must inevitably be more tentative. Similarly with the conclusions regarding the roles of geography and institutions as the ultimate sources of the divergent growth patterns. Nevertheless, even in these areas where quantification is more controversial, some conclusions are possible.

2. MEASURING ECONOMIC GROWTH BEFORE 1870

Until recently, most accounts of economic growth before 1870 were largely qualitative. That changed with Maddison's (2001), *The World Economy: A Millennial Perspective*, published shortly after Pomeranz's (2000) *The Great Divergence*. Table 1 sets out Maddison's estimates for the four European countries and the three Asian countries which will be the main focus of attention in this paper. The four European countries have been chosen to include the richest parts of Europe in the late middle ages (Italy and Spain) and in the modern period (Britain and the Netherlands). Similarly, the Asian economies have been chosen to include the richest parts of Asia in the early part of the second millennium (China) and in the modern period (Japan). Although Maddison's (2001) dataset represents a major breakthrough for quantification of long run economic growth, it contains a large amount of "guesstimation" or "controlled conjectures", with a number of observations set at or close to $400 in 1990 international prices. This is equivalent to most people living at "bare bones subsistence", or the World Bank poverty level of $1 per day, with a small rich elite on top. Furthermore, Maddison provides his conjectural estimates only for a small number of years.

Stimulated by Maddison's work, economic historians have recently begun to produce estimates of per capita income in a national accounting framework, based on contemporary data, and a firmer picture has begun to emerge of the contours of long run growth and development in both Europe and Asia. This is possible because medieval and early modern Europe and Asia were much more literate and numerate than is often thought, and left behind a wealth of data in documents such as government accounts, customs accounts, poll tax returns, parish registers, city records, trading company records, hospital and educational establishment records, manorial accounts, probate inventories, farm accounts, tithe files and other records of religious institutions. With a national accounting framework and careful cross-checking, it is possible to reconstruct population and GDP back to the medieval period, sometimes at decadal or even annual frequency.

2.1 Europe's Little Divergence

For some European countries, abundant quantitative information has survived, so that historical national accounts can be constructed directly on a sectoral basis in great detail. Britain and Holland have very rich data, with historical national accountants able to build on decades of detailed data processing by generations of scholars as well as well-stocked archives (Broadberry, Campbell, Klein, Overton and van Leeuwen, 2015; van Zanden and van Leeuwen, 2012). For other countries, where information is more limited, or where there has been less processing of existing data, Malanima (2011), Álvarez-Nogal and Prados de la Escosura (2013) and others have developed a short-cut method for reconstructing GDP, building on pioneering work by Crafts (1985) and Wrigley (1985). In the short-cut method, the economy is first divided between agriculture and non-agriculture. In the agricultural sector, output is estimated via a demand function, making use of data on population, real wages and the relative price of food, together with elasticities derived from later periods and the more recent experience of other less developed economies. In Allen's (2000: 13-14) notation:

$$Q^A = rcN \qquad (1)$$

where Q^A is real agricultural output, r is the ratio of production to consumption, c is consumption per head and N is population. Real agricultural consumption per head is assumed to be a function of its own price in real terms (P^A/P), the price of non-agricultural goods and services in real terms (P^{NA}/P), and real income per head (y). Assuming a log-linear specification, we have:

$$\ln c = \alpha_0 + \alpha_1 \ln(P^A / P) + \alpha_2 \ln(P^{NA} / P) + \beta \ln y \qquad (2)$$

where α_1 and α_2 are the own-price and cross-price elasticities of demand, β is the income elasticity of demand and α_0 is a constant. Consumer theory requires that the own-price, cross-price and income elasticities should sum to zero, which sets tight constraints on the plausible values, particularly given the accumulated evidence on elasticities in developing countries (Deaton and Muellbauer, 1980: 15-16, 60-82).

For the non-agricultural sector, output is assumed to have moved in line with the urban population, but with some allowance made for rural industry and the phenomenon of agro-towns. This approach began with Wrigley (1985), and has recently been combined with the demand approach to agriculture to provide indirect estimates of GDP in a number of European countries during the early modern period (Malanima, 2011; Álvarez-Nogal and Prados de la Escosura, 2013; Schön and Krantz, 2012). With the path of agricultural output (Q^A) derived using equations (1) and (2), overall output (Q) is derived as:

$$Q = \frac{Q^A}{1 - \left(Q^{NA} / Q\right)} \tag{3}$$

where the share of non-agricultural output in total output (Q^{NA}/Q) is proxied by the urbanisation rate. The approach can be made less crude by making an allowance for higher productivity in the non-agricultural sector, so that (Q^{NA}/Q) increases more than proportionally with the urbanisation rate.

The new estimates of GDP per capita based on historical national accounting data for our four key west European economies are presented in Figure 1 at annual frequency for the period 1270-1870. Figure 2 provides the same information at decadal frequency in panel A, together with Maddison's (2010) "guestimates" from Table 1 in panel B. A number of differences are immediately apparent. First, the new estimates revise upwards the level of per capita GDP in the middle ages. Medieval western Europe was substantially richer than

Maddison thought, and subsequent growth therefore more gradual. Second, the new estimates suggest a different pattern of Europe's Little Divergence. Maddison saw more or less continuous growth in the whole of western Europe, with slightly faster growth in Britain and the Netherlands. The new estimates, by contrast, show little or no trend growth in Mediterranean Europe, where GDP per capita stagnated between 1300 and 1800, combined with relatively short bursts of episodic growth interspersed with long periods of stagnation in northwest Europe.

The reversal of fortunes between northwest Europe and Mediterranean Europe occurred in two phases. The first turning point came with the Black Death in 1348. Before then, per capita incomes were substantially higher in Italy and Spain than in Britain and the Netherlands. Although Italy, Britain and the Netherlands all received a positive boost to per capita incomes following the collapse of population beginning in the mid-fourteenth century, only Britain and the Netherlands remained permanently richer as population recovered. A second turning point occurred around 1500, as new trade opportunities opened up between Europe and Asia via trade routes around the south of Africa, and between Europe and the Americas via the Atlantic Ocean. The Netherlands first caught up with Italy then forged ahead during its Golden Age, while Britain experienced a further growth episode from the mid-seventeenth century.

Annual data are also available now for other European countries, including France, Sweden, Portugal and Poland (Ridolfi, 2016; Schön and Kranz, 2012; Krantz, 2017; Palma and Reis, 2019; Malinowski and van Zanden, 2017). In addition, some linked benchmarks are available for Belgium and Germany (Buyst, 2011; Pfister, 2011). These estimates are shown in Figure 3 and confirm the picture of no trend growth outside northwest Europe, which forged ahead of the rest of the European continent from around 1500, led initially by the Netherlands, then by Britain.

One further point is worth noting from both the annual and decadal data plotted in Figures 1 to 3. This is the alternation of periods of positive growth and negative growth or "shrinking", leaving little or no progress in the level of per capita incomes over the long run. This is particularly clear in the cases of Italy and Spain in Figures 1 and 2A, where per capita GDP fluctuated without trend between 1300 and 1800. For Britain and the Netherlands, by contrast, although there were alternating periods of positive and negative growth until the eighteenth century, there was also a clear upward trend, with the gains following the Black Death being retained, and the periods of shrinking eventually disappearing with the transition to modern economic growth. One way to think about Europe's Little Divergence, and also the Great Divergence, is therefore not so much the beginning of growth, but rather the weakening and ending of periods of shrinking. A key feature of the successful economies was resilience in the face of negative shocks, a lesson which we would do well to relearn today. This point has been developed further by Broadberry and Wallis (2017).

2.2 Asia's Little Divergence

Data are available in abundance for some Asian economies for some time periods, but there has been relatively little work so far processing this material. Much work remains to be done on the Chinese data, but it is now possible to produce decadal estimates of GDP from the output side, apart from during dynastic changes (Broadberry, Guan and Li, 2018; 2021). Indian data are less abundant, and it has so far only been possible to produce decadal estimates back to 1800 and benchmarks every half century between 1600 and 1800 (Broadberry, Custodis and Gupta, 2015). Apart from Abū 'l-Fazl's [1595] remarkable document, *The Ā' īn–i-Akbarī*, most of the information about India comes from the records of the European East India Companies and the British Raj. Japan also has a wealth of data, but at this stage the estimates are available only for a handful of benchmark years (Bassino, Broadberry, Fukao, Gupta and Takashima, 2019).

The results for Asia in Figure 4, like those for Europe in Figure 2, suggest a general upward revision of early GDP per capita compared with Maddison's estimates. China was substantially richer than Maddison thought during the Northern Song and Ming dynasties and India was richer than Maddison believed at the height of the Mughal Empire. Interestingly, however, the upwards revision of Maddison's conjectural estimates of GDP per capita in Japan are for the late nineteenth century, as Fukao, Bassino, Makino, Peprzycki, Settsu, Takashima and Tokui (2015) argue that Maddison overstated Japanese growth during the late nineteenth century and first half of the twentieth. This means that projecting back from 1990, Japan was more developed than has been widely appreciated by the time of the Meiji Restoration in 1868. As a result of these changes, the new estimates show a much more significant reversal of fortunes within Asia than suggested by Maddison. In one way, this Asian Little Divergence resembles the European Little Divergence, with Japan achieving trend growth over the long run, like Britain and the Netherlands. However, there were also important differences. First, economic growth was slower in Japan than in northwest Europe, and second, the divergence was as much the result of an increase in negative growth or shrinking in China and India. Note further that, given the wide acceptance by researchers of the low levels of per capita income in Asia in the nineteenth century and the relatively high levels of per capita income in medieval Europe, China can only have been a relatively rich country in the Northern Song and Ming dynasties if there was significant shrinking of per capita incomes during the population expansion of the Qing dynasty.

2.3 The Great Divergence

Table 2 puts together the new GDP per capita estimates for Europe and Asia from Figures 1 to 4, while Figure 5 plots the data for 5 of the countries to provide a focus on the Great Divergence. China was surely one of the richest countries in the world at the beginning of the second millennium, with per capita GDP of around $1,000 in 1990 international prices. The most reliable estimate that we have for Europe around this time is the figure of $723 for Britain in 1086, based on the Domesday Survey (Broadberry, Campbell, Klein, Overton and van Leeuwen, 2015: 375; Walker, 2014). For Italy, Malanima (2011) suggests a per capita GDP of close to $1,500 by 1300, but this had grown substantially since the eleventh century as long distance trade recovered following its collapse during the Dark Ages, and using Malanima's (2002: 450) growth rate between 1000 and 1300 yields an estimate of $911 for the early eleventh century. China was going through its Mongol interlude in the fourteenth century, so that estimates of GDP per capita are not available, but it is unlikely that Chinese per capita incomes were any higher than during the preceding Northern Song dynasty or the following Ming dynasty. It is therefore tempting to use the Italian and Chinese data to conclude that the Great Divergence was already underway by the fourteenth century, while in the fifteenth and sixteenth centuries the temptation becomes even stronger with both Italy and the Netherlands clearly ahead of China in terms of GDP per capita.

However, we must be careful here before concluding that the Great Divergence began in the early modern period or even during the late medieval period, since China was dramatically larger than any individual European country. Chinese population in 1600 was 160 million, compared with just 13.1 million in Italy, 4.2 million in Great Britain and 1.5 million in the Netherlands (Maddison, 2010). Even France, which was western Europe's largest nation, had a population of only 18.5 million in 1600. While the GDP per capita gap between the leading west European nations and China remained small, as it did until the eighteenth century, smaller Chinese regions of comparable size, such as the Yangzi delta, may still have been on a par with the richest parts of Europe.

Li and van Zanden (2012) have produced a comparison of GDP per capita in the Yangzi delta and the Netherlands in the early nineteenth century, finding per capita incomes in the Yangzi delta to be around half of the level in the Netherlands in the 1820s. This suggests a per capita GDP figure of around $1,050 for the Yangzi delta, in 1990 international dollars, or about 75 percent higher than in China as a whole. Applying the ratio between the Yangzi delta and China as a whole in the 1820s to Chinese GDP per capita for earlier years produces a quantification of the leading Chinese region for comparison with the European leader in Figure 6. This does not have to mean that the Yangzi delta was always the leading region, but rather that there was always a region that was proportionally as far above the Chinese average as the Yangzi region in the 1820s. The "European leader" series is based on Italy until the 1540s, followed by the Netherlands until the 1800s and then Great Britain. On this basis, it is only after 1700 that a significant gap opened up between the leading regions of Europe and Asia.

It is reassuring that the historical national accounting evidence suggests the eighteenth century as the point in time when the gap between Europe and Asia became too large to ignore, since this seems to be the new consensus that is emerging from both California School authors such as Pomeranz (2011; 2017) and from economic historians using other quantitative indicators such as real wages and urbanization rates (Broadberry and Gupta, 2006; Allen, Bassino, Ma, Moll-Murata and van Zanden, 2011). It seems that the California School authors were right to point to the importance of regional variation within both Asia and Europe, but a bit too optimistic about the performance of the richest parts of Asia during the eighteenth century.

2.4 Reliability of the estimates

It is worth adding a note of caution, given uncertainties about the accuracy of the underlying data used in historical national accounting for the pre-modern period. Bowley (1911-12) pioneered the subjective error margins approach which was subsequently taken up in the construction of historical national accounts by Chapman (1953) and Feinstein (1972) for the case of Britain. Feinstein and Thomas (2002) provide a more recent statement of the case for the use of subjective error margins. In this approach, series are assigned reliability grades corresponding to error bands. Feinstein (1972: 21) suggested that for firm figures (grade A), the margin of error around the reported series should be judged to be ± less than 5%. For good estimates (grade B), the margin of error is ± 5% to 15%, while for rough estimates (grade C) the margin of error is ± 15% to 25% and for conjectures (grade D) it is ± more than 25%.

These subjective margins of error, set out in Table 3A, are then assumed to be held with 95 percent confidence, so that the average margin of error can be interpreted as two standard errors. Perkins (1969: 216) suggested an 80 percent confidence interval would be more appropriate for the less well documented Chinese case, although the statistical basis for either of these assumptions is somewhat tenuous. Bowley (1911-12) goes on to suggest that when constructing a composite series such as GDP, it is likely that some errors will be offsetting, with an upward bias in one series countered by a downward bias in another series. The subjective error margins approach has been explicitly adopted in a number of the recent studies in historical national accounting that have been used in the Great Divergence debate. The study of the Netherlands by van Zanden and van Leeuwen (2012) was the first long run study to make use of this approach, which has also been applied to the cases of China and Japan (Broadberry, Guan and Li, 2018; Bassino, Broadberry, Fukao, Gupta and Takashima, 2019). The latter two studies also conduct sensitivity analysis, reporting the percentage increase (decrease) in GDP in response to an increase (decrease) of one average margin of error in each component series.[1]

These exercises help to highlight where the strengths and weaknesses of the estimates lie. First, and perhaps unsurprisingly, for all three countries, the GDP series listed in Table 3B become more reliable as they move nearer the present, due to the greater quantity of available data. Second, since it is likely that some series are biased upwards and others downwards, some offsetting errors may be expected in the aggregates derived as the sum of individual series, so long as those series are derived independently (Feinstein and Thomas, 2002; Bowley, 1911-12). This explains the higher grades for GDP than for some of the component series in all three countries. Third, error margins for ratios may also be lower than suggested by the accumulation of error margins for the component series where the errors are positively correlated (Feinstein and Thomas, 2002; Bowley, 1911-12). In the case of China, this applies to GDP per capita, which is heavily influenced by the ratio of cultivated land to population. Since the population and cultivated land data were collected by the imperial authorities, it is likely that an under-estimate of one was accompanied by an under-estimate rather than an over-estimate of the other (Broadberry, Guan and Li, 2018: 981).

2.5 Dynamics of the Great Divergence

Settling the timing of the Great Divergence does not mean that what happened earlier can be disregarded in seeking to understand its origins. It is important to also examine the dynamics

[1] Note that although Broadberry, Guan and Li (2021) improve the series for government services in response to a comment by Solar (2010), the revised GDP series remains within the error margins set out in Broadberry Guan and Li (2018).

of the income process. One of the most interesting developments of the recent wave of research in historical national accounting has been the construction of annual estimates of GDP per capita reaching back to the thirteenth or fourteenth century for a number of countries. Using these data, a radically new picture of the Industrial Revolution has appeared. Northwestern Europe forged ahead of the rest of Europe and also diverged from Asia not by growing faster during periods of positive growth, but rather by reducing the frequency and rate of shrinking during periods of negative growth (Broadberry and Wallis, 2017). Indeed, the period of improved long-run economic performance actually took place at a time when the average rate of growing during periods of positive growth was slowing down. This process of avoiding growth reversals in northwestern Europe can be traced back to the growth episode following the Black Death of the mid-fourteenth century. In this sense, the origins of the Great Divergence are still to be found in the late medieval period, as earlier generations of economic historians argued, even though at this stage northwestern Europe had not forged ahead of the rest of Europe or Asia.

Explaining the Industrial Revolution has more in common with solving the problem of development today than is usually acknowledged. Getting growth going in the first place, the traditional focus of analysis, is only part of the story. Just as important is ensuring that periods of positive growth are not followed by periods of negative growth, or shrinking (Broadberry and Wallis, 2017). This has been highlighted in the case of developing economies today by Easterly, Kremer, Pritchett and Summers (1993) and Pritchett (2000). For the transition to modern economic growth in Britain during the Industrial Revolution, it means paying as much attention to the absence of negative trend growth after the Black Death as to the innovations that started episodes of positive growth during the eighteenth century. This requires looking into the explanatory factors behind the Great Divergence.

3. EXPLAINING THE GREAT DIVERGENCE: PROXIMATE SOURCES

A second way of accounting for the Great Divergence is to provide an explanatory framework. Armed with the estimates of economic growth before 1870 from Table 2 and Figures 1 to 6, this paper now turns to explanation. The framework adopted here is based on Maddison's (1988) distinction between proximate and ultimate sources of economic growth, also adopted in the forthcoming *Cambridge Economic History of the Modern World* (Broadberry and Fukao, 2021).

To assess the contribution of proximate causes, growth accounting begins with a production function 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 (Y) is produced using inputs of capital (K) and labour (L) and A is a measure of efficiency or total factor productivity (TFP):

$$Y = AF(K, L) \tag{4}$$

The growth rate of output ($\Delta Y/Y$) can be related to the growth rates of the inputs of capital ($\Delta K/K$) and labour ($\Delta L/L$) and the growth rate of TFP ($\Delta A/A$).

$$\Delta Y/Y = \alpha\, \Delta K/K + \beta \Delta L/L + \Delta A/A \tag{5}$$

The weights α and β reflect the relative importance of inputs in the production process, measured by their shares 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 growth accounting equation can also be written in intensive rather than extensive form, to show how the growth of per capita output can be explained by the growth of capital per worker (capital deepening) or total factor productivity growth:

$$\Delta y/y = \alpha\, \Delta k/k + \Delta A/A \tag{6}$$

where the growth of output per capita ($\Delta y/y$) is equal to the growth of output minus the growth of labour, and the growth of capital per worker ($\Delta k/k$) is the growth of capital minus the growth of labour.

The framework can be adapted to include human capital (H) and land (R) as additional factor inputs. This results in the extensive form growth accounting equation:

$$\Delta Y/Y = \alpha\, \Delta K/K + \beta \Delta L/L + \gamma \Delta H/H + \theta \Delta R/R + \Delta A/A \qquad (7)$$

where the weights γ and θ reflect the relative importance of human capital and land in the production process. The intensive form growth accounting equation then becomes:

$$\Delta y/y = \alpha\, \Delta k/k + \gamma \Delta h/h + \theta \Delta r/r + \Delta A/A \qquad (8)$$

where the growth of labour quality ($\Delta h/h$) is equal to the growth of human capital minus the growth of labour, and the growth of land per worker ($\Delta r/r$) is the growth of farmed land minus the growth of labour.

The labour input is measured not just by the number of workers, but must also take into account the number of days worked per person per year and the quality of the labour force. In economic history, these aspects are usually discussed under the headings “industrious revolution” and “human capital” (de Vries, 1994; Baten and van Zanden, 2008). The capital input encompasses both working capital and fixed capital, with the balance shifting towards the latter during the process of development (Feinstein, 1978; 1988). With independent measures of output, labour and capital, total factor productivity is derived as a residual, famously described by Abramovitz (1956: 11) as “some sort of measure of our ignorance”, but often used as an indicator of technological change.

3.1 The quantity and quality of labour

Differences in both the quantity and quality of labour have received attention in the literature as factors explaining the Great Divergence. Differences in the quantity of labour supplied by individuals have been used to explain the Little Divergence within Europe at least since Max Weber (1930) introduced the idea of the protestant ethic. However, the idea has now been secularised in the term "Industrious Revolution", widely associated with de Vries (1994), but originally coined by Hayami (1967) to describe developments in Tokugawa Japan. The basic idea is that people worked harder to obtain new goods made available by long distance trade and industrial innovation. As people worked more days per year, their annual incomes rose accordingly.

The firmest quantitative evidence of an industrious revolution is available for Britain. Figure 7 sets out the empirical evidence on annual days worked per person in England, drawing on a study by Humphries and Weisdorf (2019), obtained from a comparison of wages for workers on annual contracts with day rates for workers performing the same tasks. The length of the working year more than doubled from less than 150 days at the beginning of the sixteenth century to more than 300 by the early nineteenth century. Although workers can be seen as willingly supplying the extra labour so as to increase their consumption, it is more usual to emphasise changes on the demand side of the labour market, including a large reduction in the number of holidays per year following the Reformation, and a further loss of around 50 holidays per year during the Industrial Revolution as employers ceased to tolerate the customary practice of people not turning up for work on the first day of the week, known colloquially as St Monday (de Vries, 2008: 88; Voth, 1998; 2001). De Vries (2008: 87-92) discusses the less systematic evidence for other European countries, finding a similar pattern in the Netherlands but a slower elimination of saints' days in countries that remained catholic. Malanima's (2011: 203) calculation of the number of working days per year in Italy, using the marginal productivity theory of distribution, is consistent with this, yielding an average of 182 days per year between 1350 and 1820, but with an increase during the sixteenth century.

Hayami (1967) saw the Japanese industrious revolution during the Tokugawa period as underpinned by opportunities for women in protoindustrial work, particularly in the silk industry, and later in cotton textiles. These opportunities in industry also arose in early modern Europe, but Voigtländer and Voth (2013) also emphasise the labour market opportunities for European females in livestock agriculture, which formed a larger share of the farm sector, particularly in northwest Europe. Although Pomeranz (2000: 91-206) also argues for an industrious revolution in China, Huang (2002) views this as a misinterpretation of what he calls “involution”. For Huang, Chinese over-population led to smaller landholdings, driving women to work in proto-industry just to remain at subsistence. Without the link to fertility through the age of first marriage for females, and the accumulation of human capital emphasised in the Japanese case by Saito (2012), working harder did not lead to long run economic development.

In the long run, it was the quality of the labour supplied by individuals as human capital was accumulated that mattered more than the quantity of labour as the working year lengthened, since the latter could not go on increasing indefinitely. Again, the clearest long run evidence on human capital is available for Britain, from a study by de Pleijt (2018) of literacy rates and the number of schools in England between 1300 and 1900. De Pleijt’s estimates of literacy rates are shown here in Table 4, indicating an increase in literacy from just 2.0 per cent of men and 0.7 per cent of women in 1300 to 95 per cent of men and 94 per cent of women by 1900. The stock of human capital can be obtained by multiplying the literacy rate with the population. The best comparative data on labour quality are obtained from Buringh and van Zanden’s (2009) study of manuscript and printed book production in Europe, shown on a per capita basis in Table 5. Northwest Europe can be seen as having an advantage in the area of human capital accumulation because of its approach to marriage. Hajnal (1965) argued that northwest Europe had a different demographic regime from the rest of the world, characterised by late marriage for women, high proportions never marrying and predominantly nuclear families, which he saw as limiting fertility. Although he originally called this the European Marriage Pattern (EMP), later work established that it applied only to the northwest of the continent.

The European Marriage Pattern has been linked to the availability of labour market opportunities for females, who were able to engage in market activity before marriage, thus increasing the age of first marriage for females and reducing the number of children conceived (de Moor and van Zanden, 2010). Later marriage and fewer children are associated with more investment in human capital, since the women employed in productive work can accumulate skills, and parents can afford to invest more in each of the smaller number of children because of the “quantity-quality” trade-off (Voigtländer and Voth, 2013). Part A of Table 6 summarises the results of a large number of detailed national, regional and local studies in the North Sea area and Mediterranean Europe, reaching back to the sixteenth century, taken from Dennison and Ogilvie (2014). It suggests a relatively high age of marriage during the early modern period in England and the Netherlands compared with Italy and Spain, although Dennison and Ogilvie point out that the former were not the most extreme cases of the European Marriage Pattern, and are sceptical about the link between the EMP and economic performance within Europe. Part B of Table 6 presents similar data for Asia. Although the informational basis is weaker than in Europe, it does nevertheless point to marriage patterns playing a role in the Asian Little Divergence and the Great Divergence between Europe and Asia. Although the female age of first marriage in China and India was much lower than in northwest Europe, Japan was an intermediate case, closer to the experience of England. The average age of first marriage for females was 22.1 in Tokugawa Japan, compared with 25.4 in eighteenth century England, but 18.6 in late Ming and Qing China and just 13.0 in modern India.

3.2 Physical capital and land

Systematic estimates of the capital stock are rare for the period before the late nineteenth century. Again, the most reliable data are for Great Britain, where Feinstein (1988) produced estimates back to 1760 using the perpetual inventory method, ensuring consistency between the stock of capital and the flows of investment. A recent study by Broadberry and de Pleijt (2021) extends the work of Feinstein back in time to provide new estimates of British investment reaching back to 1270 and the capital stock covering the period 1350-1870, set out in Table 7. The most important series for growth accounting is the fixed capital stock excluding dwellings, set out in the second column. However, the table also includes data on fixed capital including dwellings and working capital, which add up to fixed reproducible capital. Notice how fixed capital increased in importance relative to working capital after the medieval period. Whereas working capital and fixed capital excluding dwellings were of broadly similar magnitudes until 1500, working capital was less than one third as large by 1870.

Agriculture was an important sector in the pre-industrial world, so that growth accounting studies for this period normally include a variable for the farmed land area. Broadberry, Campbell, Klein, Overton and van Leeuwen (2015: 74) provide a series of arable acreage for England covering the period 1270-1870. The pastoral acreage can be less accurately measured, but is generally taken to be about the same as the arable acreage in the English mixed farming system (Broadberry, Campbell, Klein, Overton and van Leeuwen, 2015: 47-50). The total farmed acreage set out in Table 8 is thus assumed to be twice the arable acreage. The farmed acreage declined after the Black Death, as population collapsed, and began to increase again from the mid-fifteenth century as population recovered.

3.3 Growth accounting

Table 9 presents the results of the growth accounting exercise in extensive form using equation (7). The labour input is the number of days worked, obtained as the product of the population from Broadberry, Campbell, Klein, Overton and van Leeuwen (2015) and the annual number of days worked per person from Humphries and Weisdorf (2019). The stock of human capital is measured by the literacy rate from de Pleijt (2018) multiplied by the population. The capital stock from Broadberry and de Pleijt (2021) is measured by fixed capital excluding dwellings. The land variable is the total farmed acreage from Broadberry, Campbell, Klein, Overton and van Leeuwen (2015). The factor input weights are 40 per cent for labour, 20 per cent for human capital, 30 per cent for capital and 10 per cent for land, in line with the weights used by van Zanden and van Leeuwen (2012) for the Netherlands during the early modern period.

Input growth was driven primarily by population growth. Following the Black Death, which wiped out one-third of the population within three years and more than half the population within a century of its arrival in 1348, total days worked declined at an annual rate of -1.69 percent. More modest episodes of population decline during the first half of the fifteenth century and the second half of the seventeenth century were offset by an increase in days worked. Population growth returned after the 1690s and increased sharply from the mid-eighteenth century. Capital growth became noticeably more important from the 1830s. Note that the last two columns (weighted input growth and TFP growth) add up to the first column (output growth). The main result from Table 9 is that output growth was driven predominantly by the growth of weighted inputs, with TFP growth the key driver only during the period 1400s-1450s.

Table 10 presents the results of growth accounting in intensive form for Britain, using equation (8) to show how the growth of labour productivity can be explained by physical and human capital deepening, changes in the land-labour ratio and growing efficiency. Human capital was the most important source of input deepening, with literacy increasing throughout the period. After an initial post-Black Death increase, the capital-labour ratio grew very little until after the 1830s. After a similar increase in in the aftermath of the Black Death, the land-labour ratio drifted downwards as population and days worked per year increased. Note that the last two columns (weighted factor deepening and TFP growth) add up to the first column (labour productivity growth). The main result from Table 10 is that labour productivity growth was driven predominantly by TFP growth, with weighted factor deepening more important only during the second half of the fourteenth century.

Although they have not been constructed using the perpetual inventory method, some rough estimates of the capital stock are available for Holland reaching back to 1540. These estimates have been used by van Zanden and van Leeuwen (2012) in a growth accounting exercise that includes human capital as well as raw labour, capital inputs and land as the factor inputs. As in the British case, and using the same weights, TFP growth is the main driver of labour productivity growth in Table 11. The weighted contributions of physical and human capital deepening and the changing land-labour ratio had little net effect on labour productivity growth. Note that the period of fastest TFP growth was 1540-1620, during the Dutch Golden Age, at 0.78 per cent per annum. This was higher than at any other time in Holland during the seventeenth and eighteenth centuries, or in Britain between the fourteenth and nineteenth centuries. However, this period of positive TFP growth was followed by a period of strongly negative TFP growth between 1620 and 1665, and barely positive TFP growth thereafter, so there was no trend increase in the level of TFP over the period 1540-1800 as a whole. The Dutch example thus serves as a reminder that negative trend growth or shrinking can occur in TFP as well as GDP per capita, and that the transition to modern economic growth requires an end to TFP shrinking as well as GDP per capita shrinking.

McCloskey (1981: 108) wrote "ingenuity rather than abstention governed the industrial revolution". Although growth accounts in extensive form over the very long run show that output growth in northwest Europe was driven largely by weighted input growth rather than by TFP growth, this does not mean that accumulation (or abstention) was more important than innovation (or ingenuity) in the Great Divergence. Rather, McCloskey's vision is confirmed using the growth accounts in intensive form. Labour productivity growth, which underpins the rise in living standards, was driven mainly by TFP growth rather than by physical and human capital deepening or by any change in the land-labour ratio.

3.4 Structural change

So far, I have focused on changes in aggregate economic indicators such as GDP per capita and population. However, Kuznets (1966) also emphasised the importance of structural change in the transition to modern economic growth. Here, it is important to distinguish between permanent and transitory change. Pre-industrial growth in Europe was typically a transitory affair, as for the cases of Italy and Spain in Figure 1. During a period of growth, as people's incomes rose, so too would their demand for industrial products and services, and this would affect the supply of labour between sectors. However, when the period of growing gave way to a period of shrinking, the process went into reverse and there was no permanent shift in the composition of the labour force. The situation was rather different in northwest Europe, however, where per capita incomes remained on a higher level after periods of growth, underpinned by permanent changes in the structure of the economy.

The first aspect of a more diversified sectoral structure in northwest Europe concerns the importance of livestock raising within a mixed arable and livestock farming, with the latter contributing a high share of agricultural value added. The data for England are shown in Table 12. In current prices the share of the livestock sector was already above 50 per cent after the Black Death, and was more than 60 per cent by the mid-fifteenth century. Although the share declined between the 1450s and the 1650s, much of this was due to an increase in the relative price of grain following the return of population growth. In constant 1700 prices, there was an upward trend in the share of the livestock sector, with just a gentle setback between the mid-fifteenth and mid-seventeenth centuries. To put things in perspective, the livestock share of agricultural value added in India in the early twentieth century was around 20 per cent (Sivasubramonian, 2000).

Table 13 gives the share of agriculture in the labour force of countries in northwest Europe and Mediterranean Europe since the medieval period. Rising per capita incomes were associated with declining shares of labour in agriculture. The growth of specialised industrial and service sectors can be seen to have proceeded much faster in northwest Europe, particularly in the Netherlands during its Golden Age of the fifteenth and sixteenth centuries and in England during the seventeenth and eighteenth centuries. By 1600, the release of labour from agriculture had proceeded further in the Netherlands than in the rest of Europe, as the Dutch economy relied increasingly on imports of basic agricultural products such as grain and paid for them with exports of higher value added products (de Vries and van der Woude, 1997). By 1700, the share of the labour force engaged in agriculture was even smaller in England, where a highly commercialised agriculture produced enough grain to feed the population without recourse to substantial imports until well into the nineteenth century (Deane and Cole, 1962; Crafts, 1985). The share of the labour force in agriculture remained at around 60 per cent throughout the period in Italy and Spain.

Table 14 provides data on the share of the population living in towns of at least 10,000 inhabitants. Urbanisation is another variable which displays the Little Divergence pattern. In the late medieval period there were two main urban centres of commerce in central and north Italy and in the Low Countries. While urbanisation stalled in north Italy after 1500, there was a brief surge in Spain and Portugal during the sixteenth century, following the opening up of the new trade routes to Asia and the New World. However, the most dramatic growth of urbanisation in the early modern period occurred in the Netherlands in the sixteenth and seventeenth centuries and in England during the seventeenth and eighteenth centuries as those countries commercialised their domestic economies to an unprecedented extent and displaced the Iberian powers in long distance trade.

4. EXPLAINING THE GREAT DIVERGENCE: ULTIMATE SOURCES

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

4.1 Institutions and the role of the state

There is a large literature on the role of state institutions, which has tended in the past to be split between those emphasising the need to impose constraints on an over-mighty state and those who emphasise the need to build up state capacity to provide essential public goods. Acemoglu, Johnson and Robinson (2005) explain the success of Britain and the Netherlands after 1500, together with the failure of Spain and Portugal, through institutional constraints on executive power. In Britain and the Netherlands, constraints on rulers are seen as sufficient to ensure that rulers were unable to act arbitrarily in their dealings with merchants. In Spain and Portugal, by contrast, states are characterised as being sufficiently powerful to prevent a strong merchant class from constraining their ability to intervene in business matters.

However, this view is countered by the work of Epstein (2000), who argues that state power was fragmented in the medieval period, with market integration hindered by the "freedoms" granted to interests such as towns and guilds, so that what was needed for growth was centralisation of state power and expansion of state capacity rather than constraints on the executive. This view is strengthened if we consider the importance of sectoral diversification, particularly the shift of labour out of agriculture. This required individual producers to be confident that they could maintain access to reliable supplies of food through the market as they left the land, and to retain the profits from their investments and innovations in non-agricultural activities. This confidence required a state with the capacity to enforce property rights, create a unified market and intervene during times of crisis. The formalised system of poor relief from the Elizabethan period, which encouraged English workers to remain in specialized non-agricultural occupations, had its origins in earlier developments at the local level, reaching back to the late-medieval period (Dyer, 2012) as well as the early Tudor period (Slack, 1988; Hindle, 2004, McIntosh, 2012). Such state institutions also required strong parliamentary control to prevent arbitrary interference in business.

The two views can be reconciled once it is recognised that a balance is needed between having a state that is strong enough to enforce property rights but not so strong that can it can appropriate all the gains from trade. Indeed, Dincecco (2011) argues convincingly on the basis of Europe's experience between 1650 and 1913 that what was needed for economic development was the establishment of a regime that was both fiscally centralised and politically limited. Fiscal centralisation was needed to ensure that the state had sufficient capacity to provide public goods such as education and transportation infrastructure, while parliamentary control was necessary to ensure that the public revenues were spent effectively and that the state did not hinder the processes of private wealth creation.

There is empirical evidence to back up the importance of the expansion of both state capacity and parliamentary control in the European Little Divergence. Early modern Britain and Holland dominated Spain and Portugal in terms of both the ability of the state to raise taxes that allowed for an expansion of state capacity and the control exercised by mercantile interests over the state through parliament. Table 15 on the ability of the state to raise fiscal revenue per capita shows a pattern of divergence between northwest Europe and the rest of the continent during the seventeenth and eighteenth centuries, with England and the Dutch Republic forging ahead. Table 16 shows very different patterns of parliamentary activity in the North Sea area and Mediterranean Europe from the twelfth to the eighteenth centuries. The index of parliamentary activity constructed by van Zanden, Buringh and Bosker (2012) is based on the calendar years per century in which parliament met. Before 1500, Parliamentary activity tended to be higher in Mediterranean Europe than in the North Sea area. In Spain and Portugal, however, activity peaked in the fifteenth or sixteenth century before going into decline. In the North Sea area, by contrast, although parliamentary activity was slow to get going, it continued to increase after 1500, reaching very high levels during the seventeenth and eighteenth centuries. A recent paper by Henriques and Palma (2020) suggests a more nuanced view on the role of parliament, arguing that it is necessary to take account of legislation passed rather than just whether or not parliament met, and this is confirmed by Malinowski's (2019) analysis of Poland-Lithuania, which collapsed in the eighteenth century despite parliament continuing to meet, as members increasingly exercised their powers of veto.

Asian states are sometimes portrayed as more centralised and autocratic than European states, thus holding back Asian economic development (Jones, 1981; Landes, 1998). However, there is little evidence to suggest that the problem was one of Asian states being too strong. In fact, it is easier to point to Epstein's (2000) problem of states being too weak to sustain integrated markets and support the trade needed to bring about prosperity. Parthasarathi (2011) makes this claim for India, and the work of Prange (2011) on the problems of piracy in the Indian Ocean supports the idea that merchants would have been better off with stronger states able to effectively enforce property rights. Data on fiscal revenue per capita in Table 15 suggest that China and India failed to keep up with northwest Europe in increasing fiscal capacity during the early modern period. Covering a longer span of history, Brandt, Ma and Rawski (2014: 67) suggest that China's per capita fiscal revenue had been on a downward trajectory since the Northern Song dynasty, falling to just 30 per cent of its Northern Song peak by the late Ming period. This decline of the fiscal state mirrors China's decline in per capita GDP. Data assembled by Sng and Moriguchi (2014) suggest substantially higher per capita tax revenue and provision of local public goods in Tokugawa Japan than in China between 1650 and 1850.

Most work on institutions focuses on the link with growing by considering incentives for investment and innovation. However, as noted earlier, the key to improved long run performance during the period 1270-1870 lies in reduced shrinking rather than increased growing (Broadberry and Wallis, 2017). Hence it is also necessary to consider the link between institutions and shrinking, which has received much less attention. The first shift of attention in this direction can be seen in North, Wallis and Weingast (2009), where it is linked to the development of an "open access" society. This is a society where access to economic rents is not limited to a small elite, but rather open to all. In such a society more individuals have the possibility of looking after their own economic interests, which is especially important when an economy is hit by negative shocks. Open access societies allow more people agency, making the economy more resilient.

4.2 The role of geography

The role of geography can be analysed using the distinction between first and second nature geography, or original and acquired advantages. First nature geography covers original or natural advantages such as mineral deposits or climate, while second nature geography covers acquired or man-made advantages 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 (Pollard, 1981; Wrigley, 2010). Recently, however, a new literature has arisen, emphasising 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 due to the benefits of agglomeration. 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 as markets become more integrated rather than being dispersed evenly around the world.

Crafts and Venables (2003) examined the extent to which differential outcomes in the global economy over the period since the mid-eighteenth century can be explained using this new approach. Here, we extend their approach to cover the period back to 1300. A number of conclusions can be drawn from Figure 8, which uses the new data on long run GDP discussed in section 2 to track shares in world GDP. First, note that China and India dominated world GDP in 1300. This was mainly because of their large populations, since although GDP per capita was slightly higher in China than in Europe (including Great Britain), it was higher in Europe than in Asia as a whole. Second, the small increase in the share of Europe (including Great Britain) between 1300 and 1348 and its subsequent decline between 1348 and 1400 was a result of differential population dynamics at the two ends of Eurasia, with European population remaining stable before 1348 and falling catastrophically after the arrival of the Black Death in 1348, while Chinese population began to decline earlier during the Mongol interlude. Notice that the European increase in GDP per capita after the Black Death was not enough to offset the effects of the dramatic fall in population. Third, the small gain in Europe's share of GDP in the first half of the seventeenth century, followed by its reversal in the second half of the century was again driven largely by demographic trends in China, as population declined sharply during the strife towards the end of the Ming dynasty and recovery during the early Qing period. Fourth, the changes in the shares of world regions became much more dramatic from the eighteenth century as Britain increased its share of world GDP, followed by continental Europe and North America.

Figure 9A charts the shares of world industrial production since 1750. Figure 9B then plots the GDP shares data from Figure 8 over the same period 1750-2000 so that, following Crafts and Venables (2003), the shares of industrial production and GDP can be compared directly. The world industrial production shares for the period 1750-1980 are taken from Bairoch (1982), and have been extended forwards in time using data from the United Nations Industrial Development Organisation. The dramatic changes in shares of world GDP that occurred from the eighteenth century in Figure 9A show up even more dramatically in shares of industrial production in Figure 9B. Although both GDP and industrial production became more concentrated in Britain, Europe and North America between 1750 and 1953, the process of concentration went much further in industrial production. This is seen by Crafts and Venables (2003) as illustrating the importance of second nature geography: as transport costs fell and the world became more integrated, it became profitable for industrialists to concentrate production in a small number of regions, where agglomeration effects increased productivity sharply. As transport costs fell still further, however, it became possible for production to become more dispersed once more. It became possible to ship intermediate goods, making the location of manufacturing in low wage economies more profitable. This led to deindustrialisation in western economies and as countries like Japan and the Newly Industrialising Countries (NICs) succeeded in industrialising, their wages increased and they too became subject to similar deindustrialisation forces. In recent decades, China has seen the largest gains in industrial output shares.

Allen (2009) also incorporates second nature geography in his explanation of the British Industrial Revolution, with urban growth and international trade playing crucial roles. The dramatic growth of London from the seventeenth century affected agricultural productivity in the counties surrounding London by encouraging specialisation and division of labour to supply a growing market. Success in international trade, first within Europe during the seventeenth century via the new draperies and later encompassing the Americas, Africa and Asia during the eighteenth and nineteenth centuries as Britain acquired a global empire, boosted the demand for labour and maintained real wages even in the face of substantial population growth (Allen, 2009: 109-111, 113-114, 118).

Allen also notes the links between the growth of London and the development of Britain's unique factor price combination of cheap coal and high wages. The coal was always in the ground, but the industry only developed as the growth of London put upward pressure on the price of firewood as the demand for fuel increased. Coal is seen by Allen (2009: 88-89) as a backstop technology, initially more expensive than wood in London because of the high cost of transporting it from Newcastle. As the price of wood rose, coal from the northeast became competitive with wood in London, and was available on a large scale at constant cost, so that its price at source remained low. The coal mining industry then spread from the northeast to western England, Scotland and Wales as the coal-burning home spread more widely across Britain. These were the regions where industry was able to benefit from coal that was cheaper than in the rest of Europe (Allen, 2009: 93-96). The high wages resulted from agglomeration economies associated with urban growth, as well as from the higher agricultural productivity in the counties surrounding the growing urban market. Allen (2009: 138-144) sees the key innovations of the Industrial Revolution as a response to high wages and low coal prices in Britain, with the new technology characterised as labour-saving and coal-using.

5. CONCLUSIONS

This paper sets out to "account" for the Great Divergence between Europe and Asia, covering issues of both measurement and explanation. Dealing with measurement, there are a number of firm conclusions. First, California School writers such as Pomeranz (2000) were correct to point to substantial regional variation in both Europe and Asia, so that the distributions of per capita income in the two continents overlapped. Second, taking account of this regional variation, Europe pulled decisively ahead of Asia during the eighteenth century rather than the nineteenth. Although this dates the Great Divergence about a century earlier than suggested by Pomeranz (2000) in the work which began the debate, it is also at least several centuries later than suggested in the traditional literature, which saw the gap as emerging around 1500 or even earlier (Weber, 1930; Landes, 1969; North and Thomas, 1971). Third, much progress has been made in documenting the regional variation in GDP per capita, with a Little Divergence within Europe, as the North Sea area economies of Britain and the Netherlands forged ahead of the previously richer Mediterranean economies of Italy and Spain. There is also evidence of an Asian Little Divergence as Japan overtook China and India, and evidence to suggest a substantially higher level of per capita income in the Yangzi delta than in China as a whole. Fourth, however, the emerging Asian leader, Japan, started at a lower level of per capita income than the North Sea area and grew at a slower rate, so continued to fall behind until after the Meiji Restoration of 1868. The key drivers of the Great Divergence in the eighteenth century were thus the transition to modern economic growth in Britain at the same time as a period of negative per capita income growth or shrinking in Qing dynasty China.

In addition to quantifying the timing of the Great Divergence, this paper also offers an explanatory account, focusing on both proximate and ultimate sources of growth. Findings here are more tentative, since there has been much less work on quantifying the explanatory factors. Nevertheless, a number of findings can be reported. First, an examination of the proximate sources of growth suggests that although the growth of output over the very long run in northwest Europe was driven primarily by the growth of the factors of production (population, days worked per person, human capital, physical capital and land), the growth of labour productivity was driven largely by TFP growth. This means that ingenuity rather than abstention governed the Great Divergence.

Second, turning to ultimate sources, state institutions were important in explaining the patterns of divergence within Europe and Asia as well as between the two continents. In the North Sea area, state capacity was able to expand, but at the same time merchants were able to exercise control over the state through parliamentary activity. This meant that the state was able to create the right incentives for accumulation and innovation that underpinned the growth of labour, human and physical capital, and TFP.

Third, however, it would be difficult to understand the Great Divergence without reference to both first and second nature geography. Crafts and Venables (2003) show how industrial production became much more concentrated than overall economic activity in core regions as transport costs fell and the world became much more integrated. Allen (2009) also emphasises the importance of the growth of London on the back of British success in international trade following the shift of Europe's trading focus from the Mediterranean to the Atlantic after 1500. This both raised wages through agglomeration economies and stimulated the development of the British coal industry in response to rising demand for fuel. Britain's unique factor price combination of high wages and low energy prices stimulated technological progress that was labour-saving and coal-using.

TABLE 1: Maddison's estimates of GDP per capita in western Europe and Asia, 1000-1870 (1990 international dollars)

	UK	NL	Italy	Spain	Japan	China	India
1000	400	425	450	450	425	466	450
1500	714	761	1,100	661	500	600	550
1600	974	1,381	1,100	853	520	600	550
1700	1,250	2,130	1,100	853	570	600	550
1820	1,706	1,838	1,117	1,008	669	600	533
1850	2,330	2,371	1,350	1,079	679	600	533
1870	3,190	2,757	1,499	1,207	737	530	533

Sources: Maddison (2010).

TABLE 2: GDP per capita levels in Europe and Asia (1990 international dollars)

	GB	NL	Italy	Japan	China	India
730				388		
950				596		
980					829	
1020			911		1,016	
1060					956	
1090	723				819	
1120					731	
1150				572		
1280	651			531		
1300	724		1,466			
1348	745	674	1,327			
1400	1,045	958	1,570		765	
1450	1,011	1,102	1,657	548	764	
1500	1,068	1,141	1,408		790	
1570	1,096	1,372	1,325		753	
1600	1,077	1,825	1,224	667	792	682
1650	1,055	1,671	1,372			638
1700	1,563	1,849	1,344	676	1,030	622
1750	1,710	1,877	1,446		726	573
1800	2,080	1,974	1,327	828	649	569
1850	2,997	2,397	1,306	904	600	556

Sources: See sources for Figures 2 and 4.

TABLE 3: Data reliability assessments

A. Data reliability grades

Reliability grade	Margin of error	Average margin of error
A. Firm figures	± less than 5%	± 2.5%
B. Good figures	± 5% to 15%	± 10%
C. Rough estimates	± 15% to 25%	± 20%
D. Conjectures	± more than 25%	± 40%

B. Reliability assessments for GDP in the Netherlands, China and Japan

	Grade
Netherlands	
1347-1510	C
1510-1650	B
1650-1750	A
1750-1807	B
China	
Northern Song (980-1120)	B
Ming (1400-1620)	B
Qing (1690-1840)	A
Japan	
Ancient (730-1150)	D
Medieval (1250-1450)	C
Tokugawa (1600-1846)	B

Sources: NL: van Zanden and van Leeuwen (2012); China: Broadberry, Guan and Li (2018; 2021); Japan: Bassino, Broadberry, Fukao, Gupta and Takashima (2019).

TABLE 4: Literacy rates in England, 1300-1900 (%)

	Men	Women
1300	2	1
1400	3	1
1500	11	4
1600	25	9
1700	42	24
1750	56	36
1800	64	42
1850	69	54
1900	95	94

Source: de Pleijt (2018: 107).

TABLE 5: Book production per thousand inhabitants

	Great Britain	Netherlands	Italy	Spain	Western Europe
1300-1399	0.4	0.2	1.0	0.4	0.5
1454-1500	2.0	7.9	6.8	0.9	3.1
1500-1549	14.6	14.2	21.3	4.2	17.5
1550-1599	27.3	33.5	51.0	4.3	29.1
1600-1649	80.0	139.0	42.1	8.8	40.6
1650-1699	191.8	259.4	56.3	14.3	66.7
1700-1749	168.3	391.3	48.4	18.5	66.7
1750-1799	192.0	488.3	86.5	28.3	122.4

Source: Buringh and van Zanden (2009: 420-421).

TABLE 6: Female age of first marriage

A. Europe

	Period	N	Mean
England	1500-1850	250	25.2
Netherlands	1500-1850	213	26.5
Italy	1500-1850	5	23.7
Spain	1500-1850	8	23.5

B. Asia

	Period	Range	Mean
Japan	1680-1860	18.8 to 24.6	22.1
China	1550-1931	17.2 to 20.7	18.6
India	1911-1931	12.9 to 13.3	13.0

Sources and notes: Part A: derived from Dennison and Ogilvie (2014: 654); N is the number of local communities included in the study and Mean is the unweighted average. Part B: Mosk (1980: 476); Lee and Wang (1999: 67); Bhat and Halli (1999: 137); Mean is the unweighted average.

TABLE 7: British capital stock, 1350-1870 (£m at constant 1700 prices)

	Fixed capital excluding dwellings	Fixed capital including dwellings	Working capital	Domestic reproducible capital
1350	61,085	116,568	51,854	168,423
1400	50,585	84,060	38,811	122,871
1450	39,161	66,992	35,307	102,299
1500	37,055	65,159	35,201	100,360
1550	47,802	85,512	42,903	128,415
1600	61,205	113,091	47,672	160,763
1650	99,111	167,003	56,010	223,014
1700	126,913	193,284	70,869	264,154
1750	135,684	204,803	87,473	292,276
1800	221,810	312,621	144,711	457,332
1850	675,057	900,586	236,653	1,137,238
1870	1,115,769	1,511,330	315,257	1,826,587

Source: Broadberry and de Pleijt (2021).

TABLE 8: Farmed acreage in England, 1270-1870

	Farmed land (m. acres)		Farmed land (m. acres)
1270	25.04	1600	17.74
1290	25.50	1650	19.26
1300	25.44	1700	19.12
1380	19.28	1750	21.02
1420	17.50	1801	22.70
1450	16.88	1836	27.74
1500	17.00	1871	27.66

Source: Total farmed acreage is twice the arable acreage from Broadberry, Campbell, Klein, Overton and van Leeuwen (2015: 74).

TABLE 9: Accounting for the growth of British GDP, 1340s to 1860s (% per annum)

	Output growth	Labour growth	Human capital growth	Capital growth	Land growth	Weighted input growth	TFP growth
1340s - 1400s	-0.73	-1.69	-0.80	-0.42	-0.56	-1.02	0.29
1400s - 1450s	-0.21	0.14	1.19	-0.48	-0.08	0.14	-0.35
1450s - 1640s	0.50	0.79	1.44	0.51	0.07	0.76	-0.26
1640s - 1690s	0.84	0.39	0.69	0.50	-0.02	0.44	0.40
1690s - 1830s	1.08	0.93	1.19	0.95	0.23	0.92	0.16
1830s - 1860s	2.28	1.31	1.73	2.87	0.00	1.73	0.55

Sources and notes: derived from Broadberry and de Pleijt (2021). Weights are 0.4 for labour, 0.2 for human capital, 0.3 for capital and 0.1 for land.

TABLE 10: Accounting for the growth of British labour productivity, 1340s to 1860s (% per annum)

	Labour productivity growth	Human capital deepening	Capital deepening	Change in land-labour ratio	Weighted factor deepening	TFP growth
1340s - 1400s	0.95	0.88	1.26	1.12	0.67	0.29
1400s - 1450s	-0.35	1.06	-0.62	-0.21	0.00	-0.35
1450s - 1640s	-0.28	0.65	-0.28	-0.72	-0.02	-0.26
1640s - 1690s	0.45	0.30	0.11	-0.41	0.05	0.40
1690s - 1830s	0.15	0.26	0.02	-0.71	-0.01	0.16
1830s - 1860s	0.97	0.42	1.56	-1.31	0.42	0.55

Sources and notes: Derived from Broadberry and de Pleijt (2021). Weights are 0.2 for human capital, 0.3 for capital and 0.1 for land.

TABLE 11: Accounting for Dutch labour productivity growth, 1540-1800 (% per annum)

	Labour productivity growth	Human capital deepening	Capital deepening	Change in land-labour ratio	Weighted factor deepening	TFP growth
1540-1620	0.87	0.12	0.51	-0.88	0.09	0.78
1620-1665	-0.86	0.60	0.07	-0.51	0.09	-0.95
1665-1720	0.12	0.60	-0.22	0.07	0.06	0.06
1720-1800	-0.64	-0.78	-0.46	-0.61	-0.36	-0.29

Source: derived from van Zanden and van Leeuwen (2012: 126). Weights are 0.4 for labour, 0.2 for human capital, 0.3 for capital and 0.1 for land.

TABLE 12: Share of the livestock sector in English agricultural value added, 10-year averages (%)

	At current prices	At constant 1700 prices
1270s	39.9	30.8
1300s	48.8	33.6
1350s	51.2	46.7
1400s	53.7	42.5
1450s	61.6	46.9
1550s	41.9	39.5
1600s	41.9	41.2
1650s	35.5	36.0
1700s	40.3	38.5
1750s	42.2	45.4
1800s	51.5	54.7
1850s	55.2	55.8
1860s	60.0	55.7

Sources: Broadberry, Campbell, Klein, Overton and van Leeuwen (2015: 118).

TABLE 13: Share of agriculture in the European labour force (%)

	England	Netherlands	Belgium	Italy	Spain
1300	--	--	--	63.4	--
1400	57.2	--	58.0	60.9	59.0
1500	58.1	56.8	64.4	62.3	65.3
1600	--	48.7	52.0	60.4	63.0
1700	38.9	41.6	47.1	58.8	62.9
1750	36.8	42.1	51.3	58.9	62.0
1800	31.7	40.7	48.7	57.8	63.5

Source: Derived from Broadberry, Campbell, Klein, Overton and van Leeuwen (2015: 344); Allen (2000: 8-9).

TABLE 14: European urbanisation rates (%)

	England	Netherlands	Belgium	Italy CN	Spain	Portugal
1300	4.0		18.2	18.0	12.1	3.6
1400	2.5		21.9	12.4	10.2	4.1
1500	2.3	17.1	17.6	16.4	11.4	4.8
1600	6.0	29.5	15.1	14.4	14.5	11.4
1700	13.2	32.5	20.2	13.0	9.6	9.5
1750	16.4	29.6	16.5	13.6	9.1	7.5
1800	22.1	28.6	16.6	14.2	14.7	7.8
1870	43.0	29.1	25.0	13.4	16.4	10.9`

Source: Malanima (2009).

TABLE 15: Per capita fiscal revenues, 1500/09 to 1780/89 (grams of silver)

	1500/09	1550/59	1600/09	1650/59	1700/09	1750/59	1780/89
Dutch Republic			76.2	114.0	210.6	189.4	228.2
England	5.5	8.9	15.2	38.7	91.9	109.1	172.3
France	7.2	10.9	18.1	56.5	43.5	48.7	77.6
Spain	12.9	19.1	62.6	57.3	28.6	46.2	59.0
Venice	27.5	29.6	37.5	42.5	46.3	36.2	42.3
Austria				10.6	15.6	23.0	43.0
Russia					6.3	14.9	26.7
Prussia			2.4	9.0	24.6	53.2	35.0
Ottoman Empire		5.6	5.8	7.4	8.0	9.1	7.1
Poland	1.5	0.9	1.6	5.0	1.2	0.8	11.2
China				7.0	7.2	4.2	3.4
India			11.1	17.4	21.9	17.6	5.5

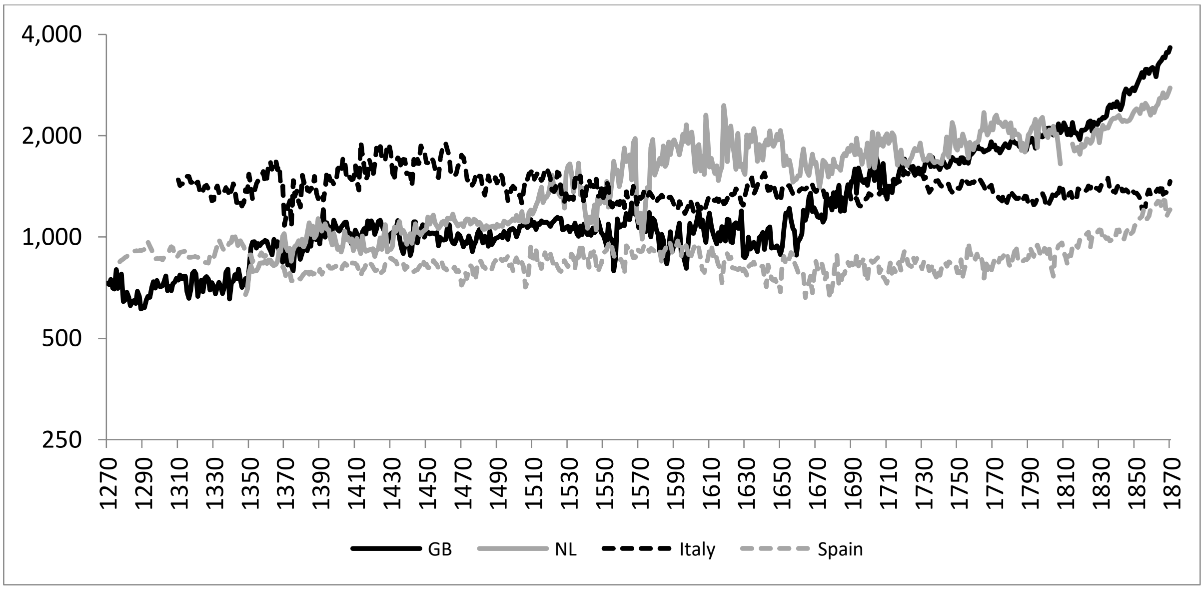
Source: Europe: Karaman and Pamuk (2010: 611); China: Brandt, Ma and Rawski (2014: 69); India: derived from Broadberry, Custodis and Gupta (2015).

TABLE 16: Activity index of European parliaments, 12th to 18th centuries (calendar years per century in which parliament met)

	12th	*13th*	*14th*	*15th*	*16th*	*17th*	*18th*
North Sea area							
England	0	6	78	67	59	73	100
Scotland	0	0	10	61	96	59	93
Netherlands	0	0	0	20	80	100	100
Mediterranean							
Castile and Leon	2	30	59	52	66	48	7
Catalonia	3	29	41	61	16	14	4
Aragon	2	25	38	41	19	11	1
Valencia	0	7	28	29	12	4	0
Navarre	2	7	17	33	62	30	20
Portugal	0	9	27	47	12	14	0

Source: van Zanden, Buringh and Bosker (2012: online appendix S1).

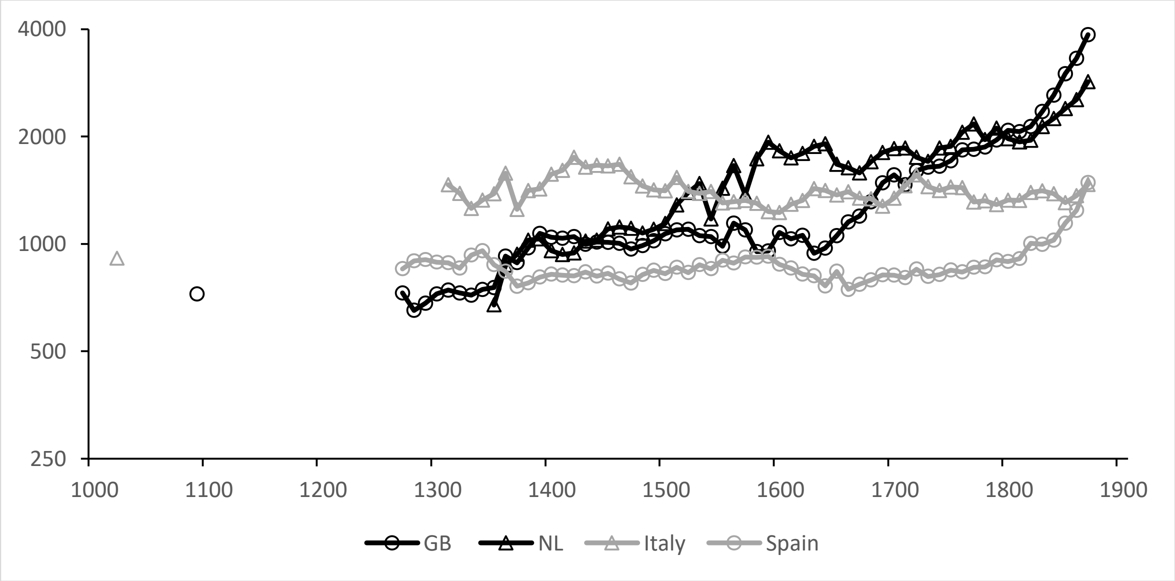
FIGURE 1: New estimates of GDP per capita in western Europe, 1270-1870 (1990 international dollars)



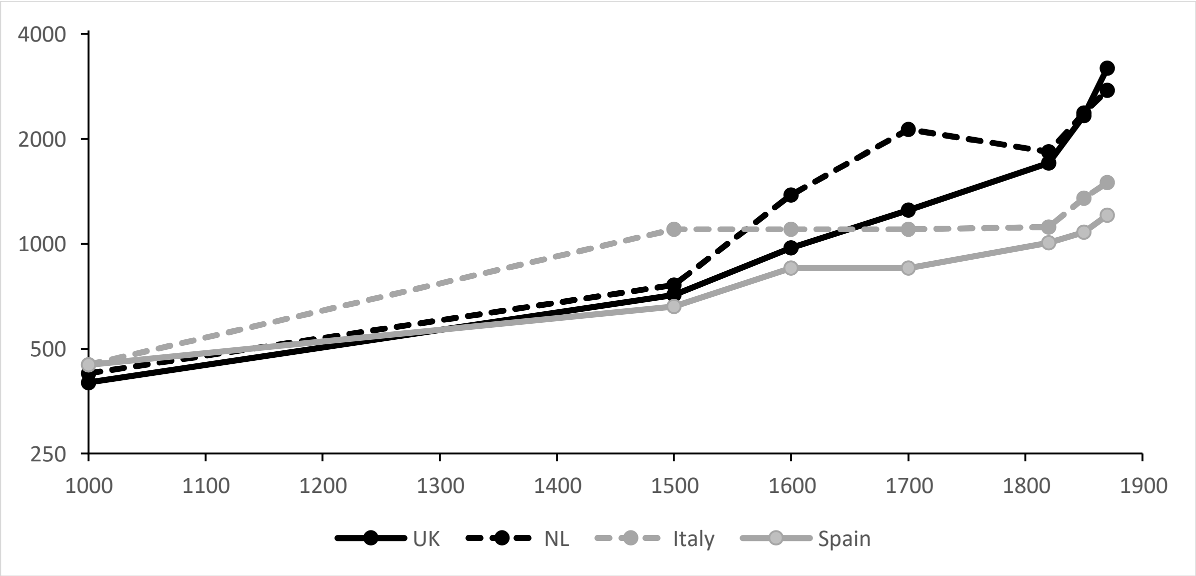
Sources: Broadberry, Campbell, Klein, Overton and van Leeuwen (2015), van Zanden and van Leeuwen (2012), Malanima (2011), Álvarez-Nogal and Prados de la Escosura (2013).

FIGURE 2: New estimates of GDP per capita in western Europe compared with Maddison's estimates, 1000-1870 (1990 international dollars)

A. New estimates



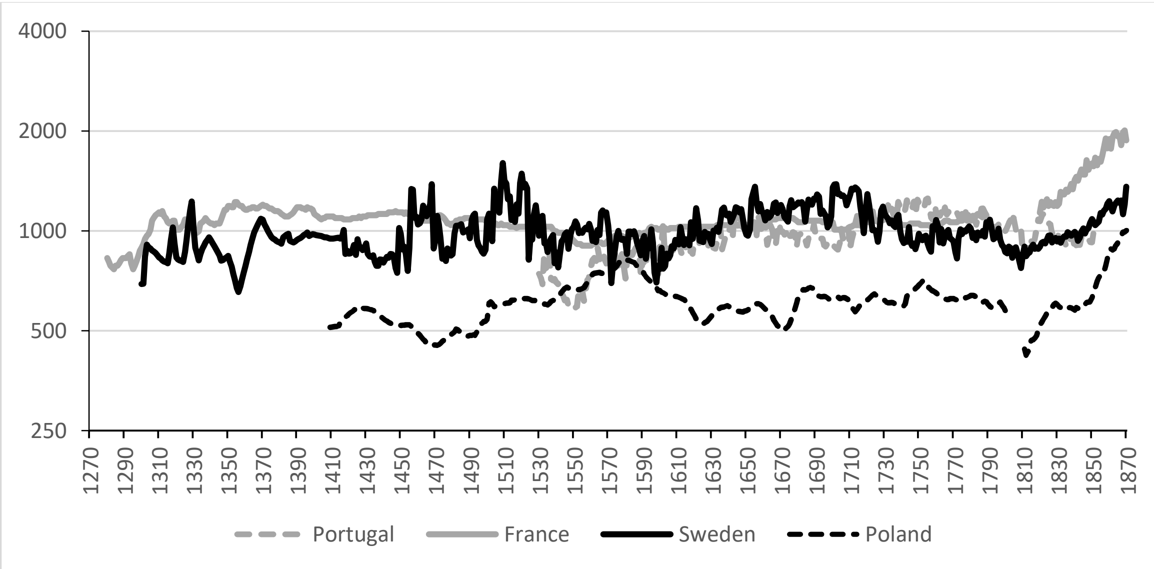
B. Maddison's estimates



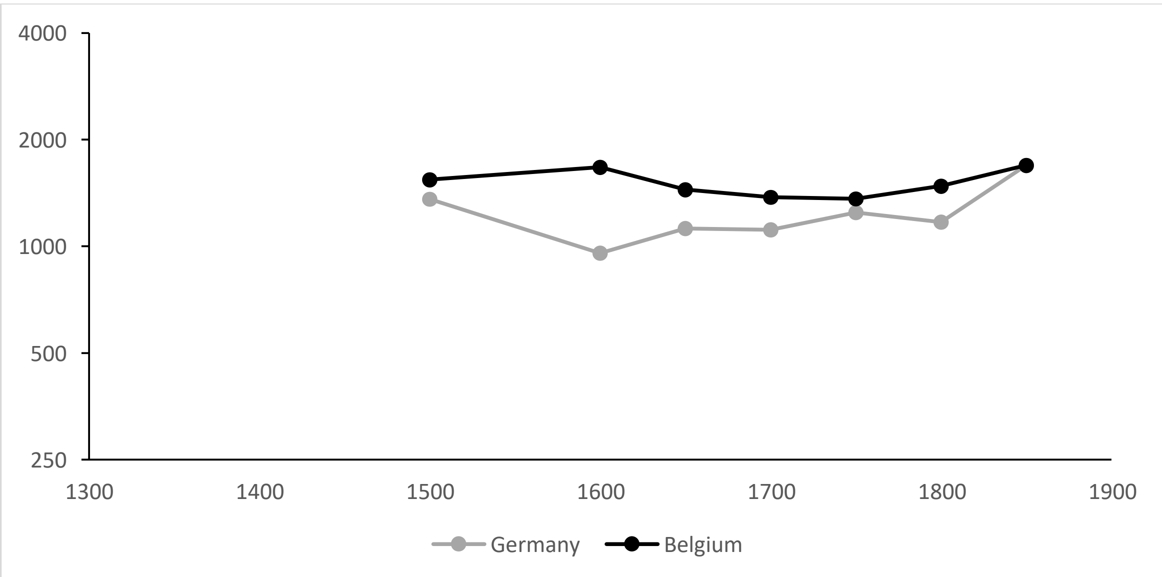
Sources: Broadberry, Campbell, Klein, Overton and van Leeuwen (2015), Walker (2014), van Zanden and van Leeuwen (2012), Malanima (2002; 2011), Álvarez-Nogal and Prados de la Escosura (2013). Maddison (2010).

FIGURE 3: Real GDP per capita in other parts of Europe, 1270-1850 (1990 international dollars, log scale)

A. Annual data



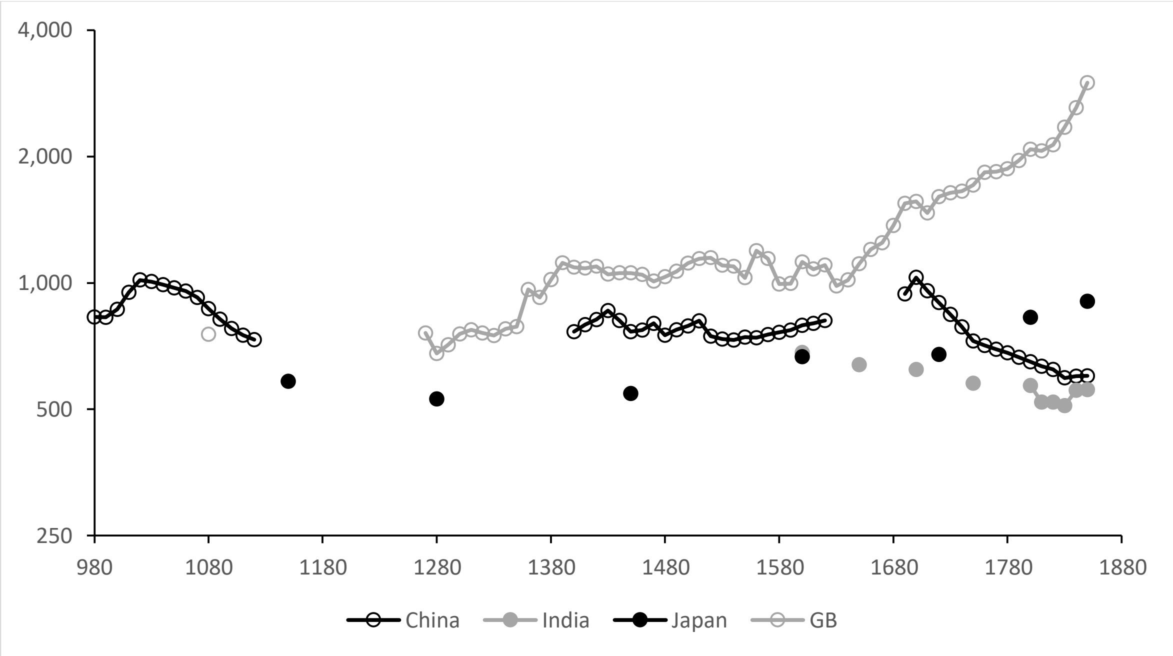
B. Benchmark estimates



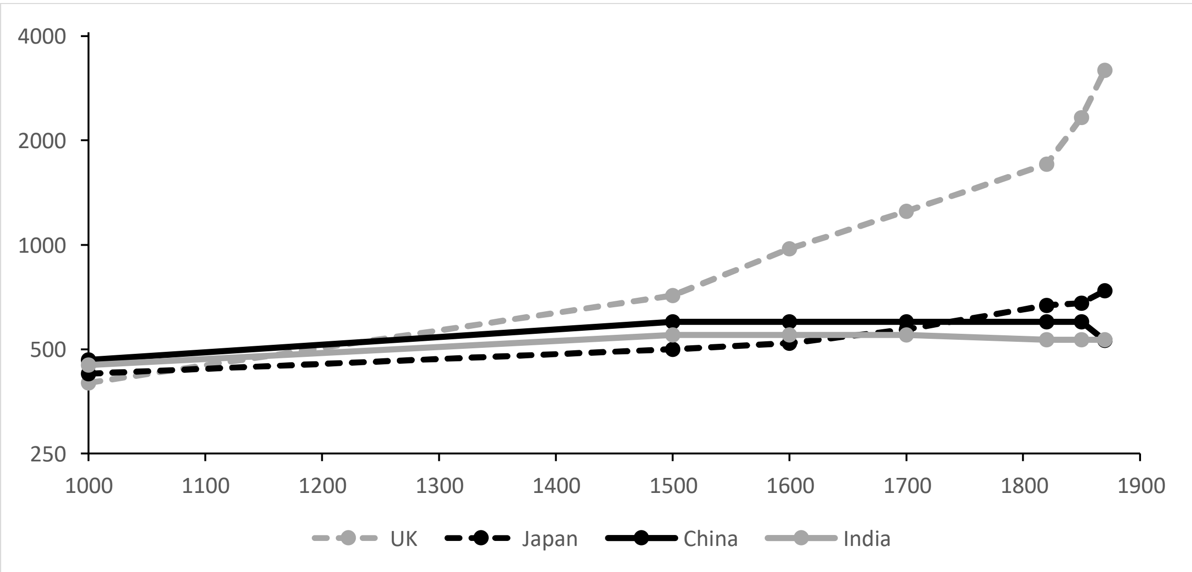
Sources: Palma and Reis (2019), Ridolfi (2016), Krantz (2017, Schön and Krantz (2012), Malinowski and van Zanden (2017), Pfister (2011), Buyst (2011).

FIGURE 4: New estimates of GDP per capita in Asia compared with Maddison's estimates, 1000-1870 (1990 international dollars)

A. New estimates

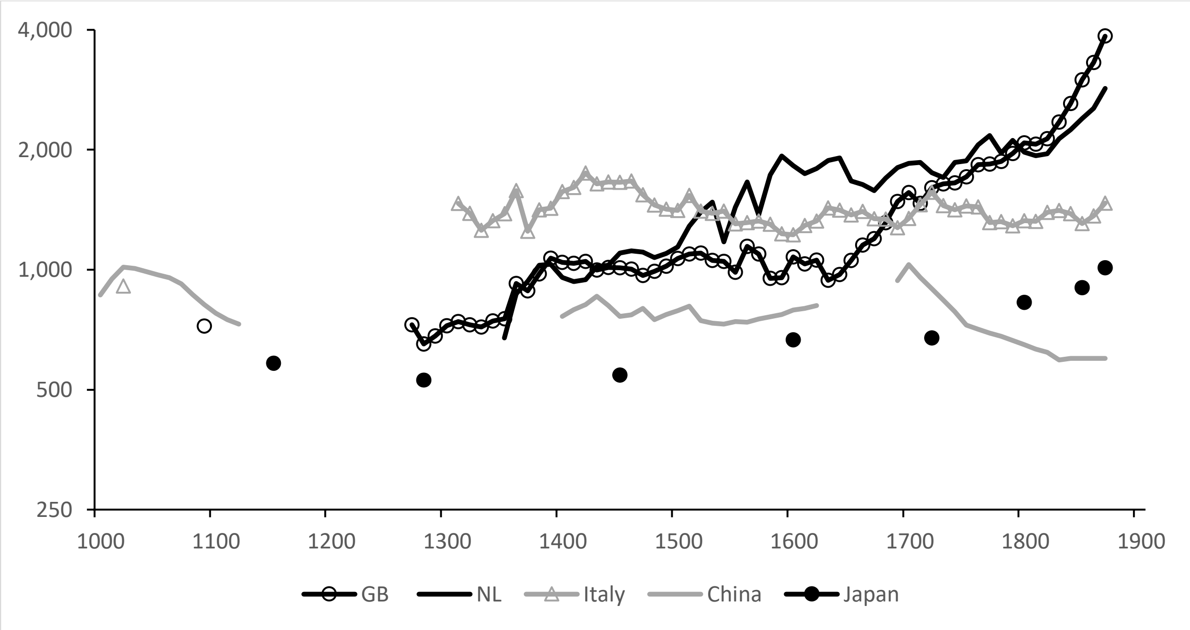


B. Maddison's estimates



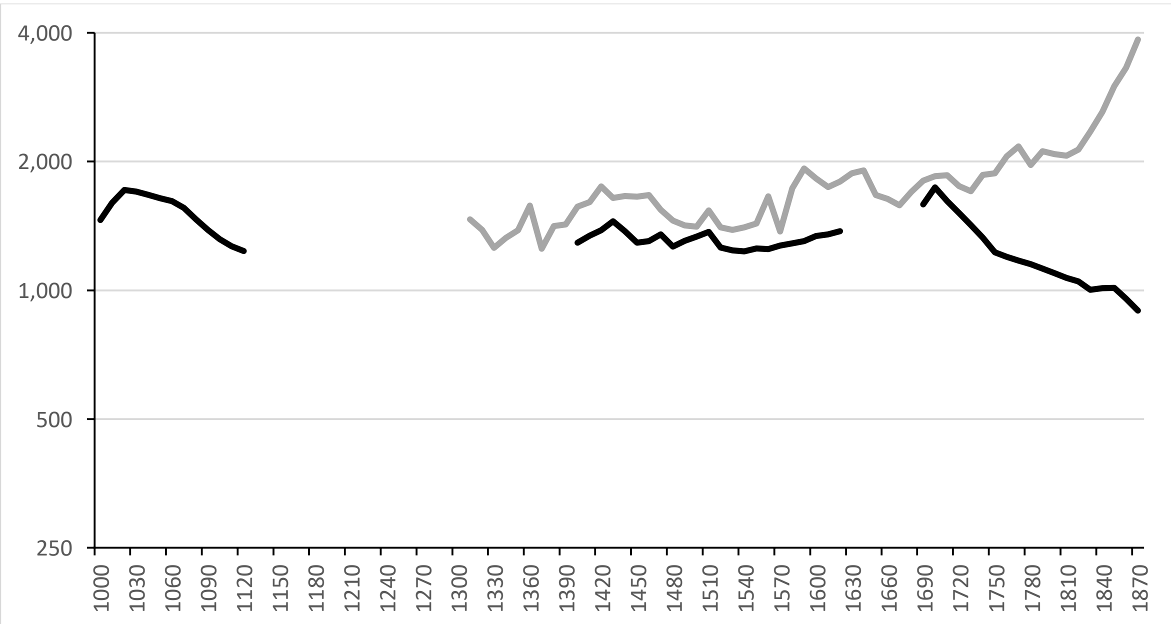
Sources: Broadberry, Campbell, Klein, Overton and van Leeuwen (2015), Broadberry, Guan and Li (2021), Bassino, Broadberry, Fukao, Gupta and Takashima (2015), Broadberry, Custodis and Gupta (2015), Maddison (2010).

FIGURE 5: GDP per capita in Europe and Asia, 1000-1870 (1990 international dollars)



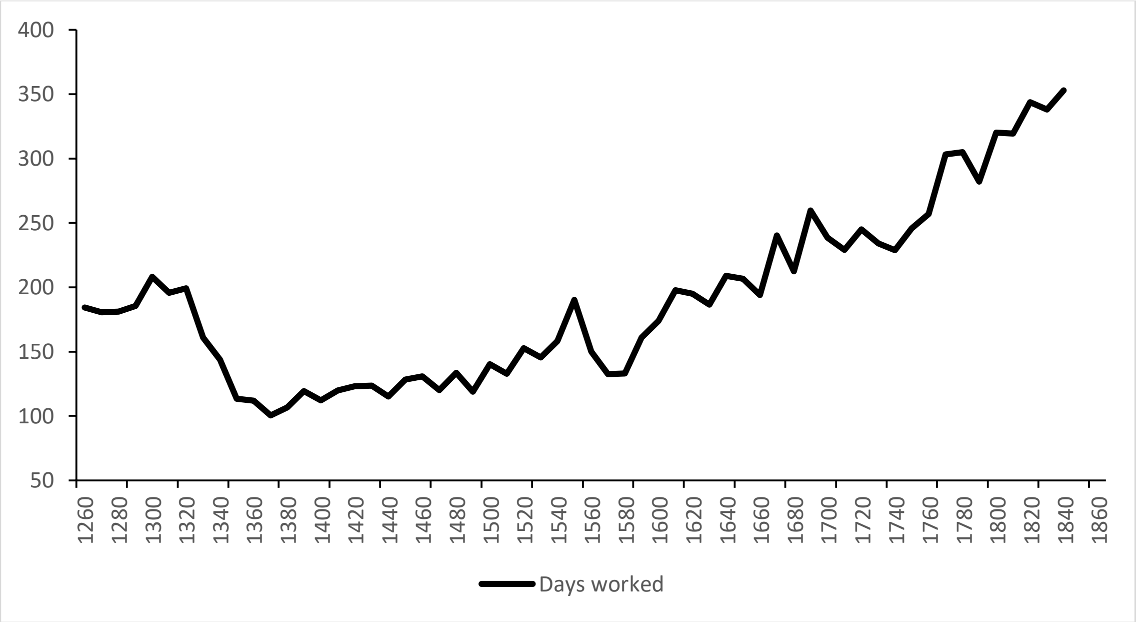
Sources: See sources for Figures 2 and 4.

FIGURE 6: GDP per capita in the leading regions of Europe and China, 1000-1870 (1990 international dollars)



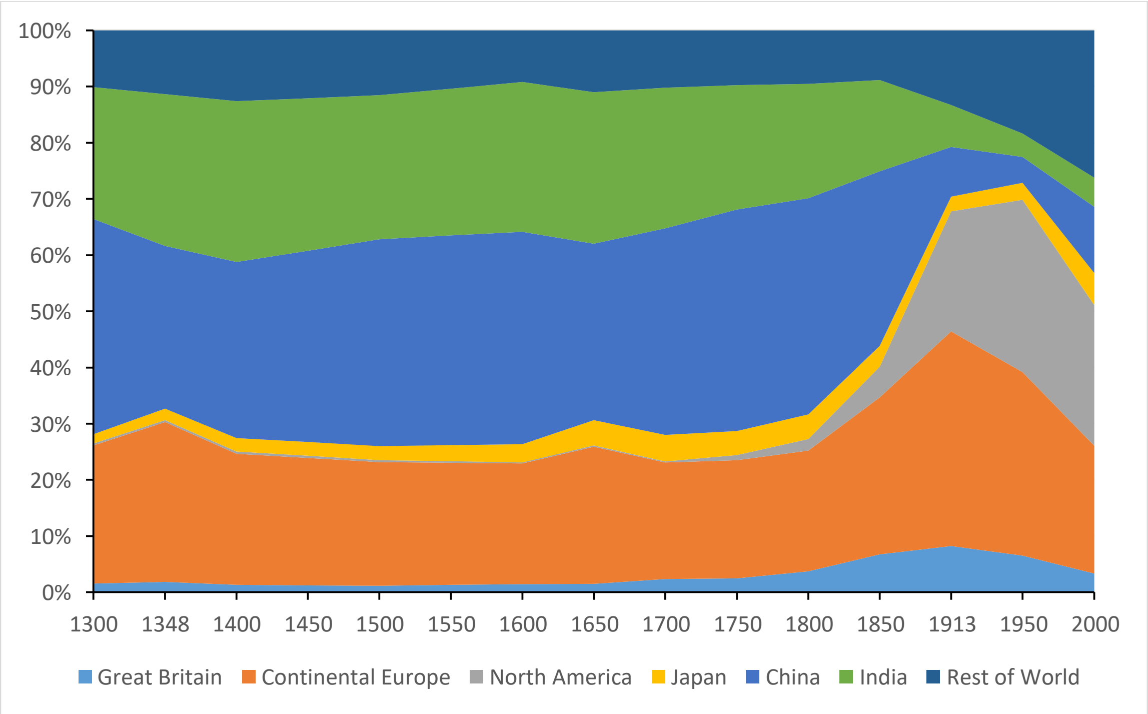
Source: Broadberry, Guan and Li (2021).

FIGURE 7: Annual days worked per person in England, 1260-1860



Source: Humphries and Weisdorf (2019).

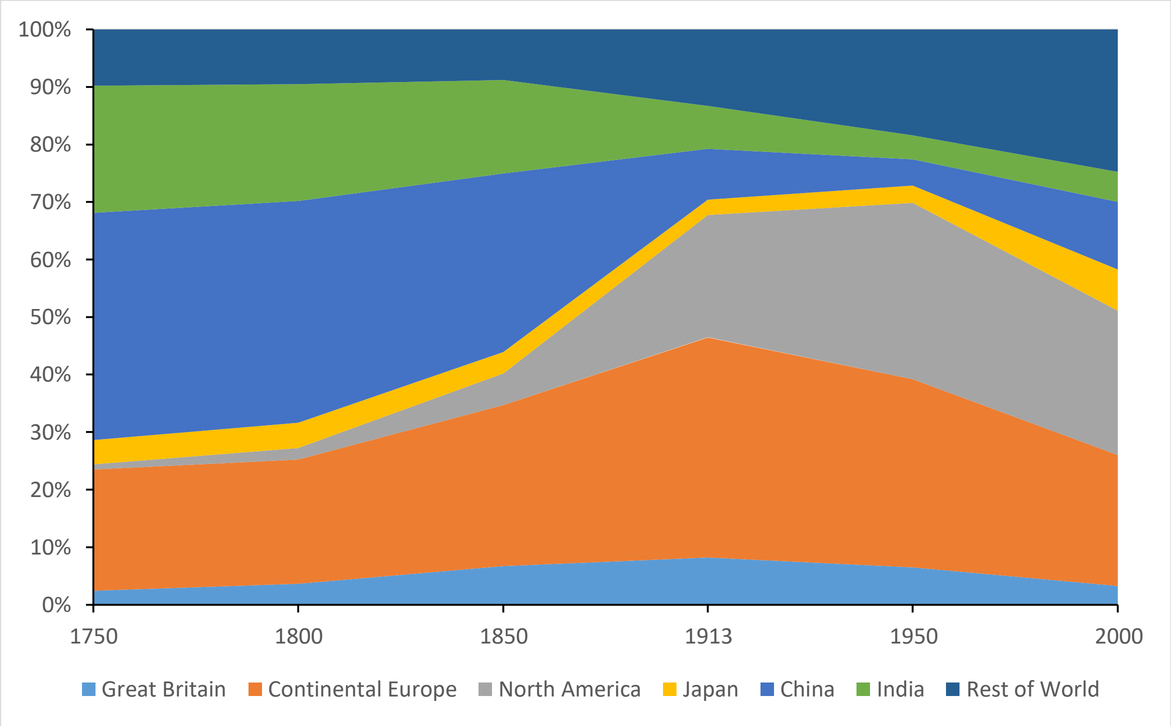
FIGURE 8: Regions' shares in world GDP, 1300-2000 (%)



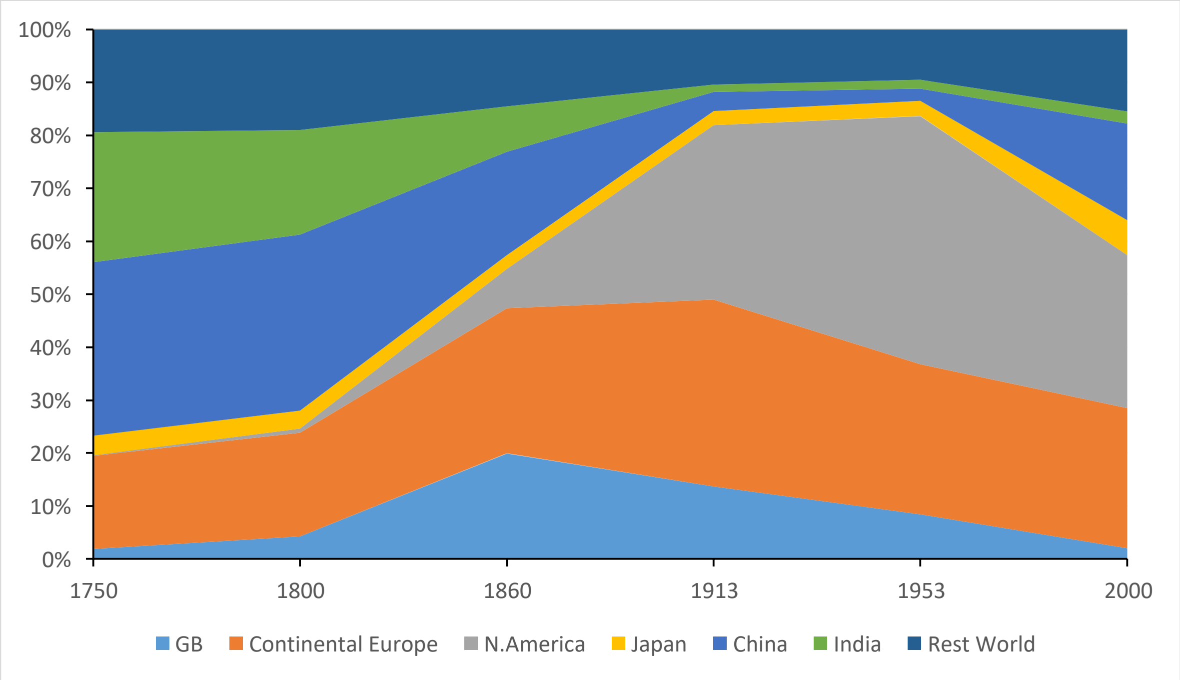
Sources: 1300-1870: derived from historical national accounting sources described in text; 1870-2000: Maddison (2010).

FIGURE 9: Regions' shares in world GDP and world industrial production, 1750-2000 (%)

A. Shares in world GDP



B. Shares in world industrial production



Sources: GDP: see notes to Figure 8. Industrial production: 1750-1980: Bairoch (1982); 1980-2000: United Nations Industrial Development Organisation, *International Yearbook of Industrial Statistics* (various issues).

REFERENCES

Abramovitz, M. (1956), "Resource and output trends in the United States since 1870", *American Economic Review, Papers and Proceedings*, 46, 5-23.

Abū 'l-Fazl [1595] (1927), *The Ā' īn–i-Akbarī*. Translated into English by H.Blochman, Delhi: Low Price Publications.

Acemoglu, D., Johnson, S. and Robinson, J. (2005), "The Rise of Europe: Atlantic Trade, Institutional Change, and Economic Growth", *American Economic Review*, 95, 546-579.

Allen, R. C. (2000), 'Economic structure and agricultural productivity in Europe, 1300-1800', *European Review of Economic History* 3: 1-25.

Allen, R.C. (2009), *The British Industrial Revolution in Global Perspective*, Cambridge: Cambridge University Press.

Allen, R.C., Bassino, J.P., Ma, D., Moll-Murata, C. and van Zanden, J.L. (2011), "Wages, prices, and living standards in China, 1738-1925: in comparison with Europe, Japan, and India", *Economic History Review*, 64, S1, 8-38.

Álvarez-Nogal, C. and Prados de la Escosura, L. (2013), "The Rise and Fall of Spain (1270-1850)", *Economic History Review*, 66, 1-37.

Bairoch, P. (1982), "International Industrialization Levels from 1750 to 1980", *Journal of European Economic History*, 11, 269-333.

Bassino, J.-P., Broadberry, S., Fukao, K., Gupta, B. and Takashima, M. (2019), "Japan and the Great Divergence, 730-1874", *Explorations in Economic History*, 72, 1-22.

Baten, J. and van Zanden, J.L. (2008), "Book Production and the Onset of Modern Economic Growth", *Journal of Economic Growth*, 13, 217-235.

Bhat, P.N.M. and Halli, S.S. (1999), "Demography of Bride Prices and Dowry: Causes and Consequences of the Indian Marriage Squeeze", *Population Studies*, 53, 129-148.

Bowley, A.L. (1911-12), "The Measurement of the Accuracy of an Average", *Journal of the Royal Statistical Society*, 75, 77-88.

Brandt, L., Ma, D. and Rawski, T. (2014), "From Divergence to Convergence: Reevaluating the History Behind China's Economic Boom", *Journal of Economic Literature*, 52, 45-123.

Broadberry, S.N., Campbell, B., Klein, A., Overton, M. and van Leeuwen, B. (2015), *British Economic Growth, 1270-1870*, Cambridge: Cambridge University Press.

Broadberry, S., Custodis, J. and Gupta, B. (2015), "India and the Great Divergence: An Anglo-Indian Comparison of GDP per capita, 1600-1871", *Explorations in Economic History* 55, 58-75.

Broadberry, S. and Fukao, K. (eds.) (2021), *The Cambridge Economic History of the Modern World*, 2 volumes, Cambridge: Cambridge University Press.

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.

Broadberry, S. Guan, H. and Li, D. (2021), "China, Europe and the Great Divergence: A Restatement", *Journal of Economic History*, (forthcoming).

Broadberry, S. and Gupta, B. (2006), "The Early Modern Great Divergence: Wages, Prices and Economic Development in Europe and Asia, 1500-1800", *Economic History Review*, 59, 2-31.

Broadberry, S. and de Pleijt, A. (2021), "Capital and Economic Growth in Britain, 1270-1870: Preliminary Findings", CEPR Discussion Paper No. 15889, https://cepr.org/active/publications/discussion_papers/dp.php?dpno=15889#.

Broadberry, S. and Wallis. J. (2017), "Growing, Shrinking and Long Run Economic Performance: Historical Perspectives on Economic Development", NBER Discussion Paper No. 23343, http://www.nber.org/papers/w23343.

Buringh, E. and van Zanden, J.L. (2009), "Charting the 'Rise of the West': Manuscripts and Printed Books in Europe: A Long-term Perspective from the Sixth Through the Eighteenth Centuries", *Journal of Economic History*, 69, 409-445.

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, http://www2.warwick.ac.uk/fac/soc/economics/events/seminars-workshops-conferences/conferences/venice3/programme/buyst.pdf.

Chapman, A.L.(1953), *Wages and Salaries in the United Kingdom 1920-1938*, Cambridge: Cambridge University Press.

Crafts, N.F.R. (1985), *British Economic Growth during the Industrial Revolution*, Oxford: Clarendon Press.

Crafts, N.F.R. and Venables, A.J. (2003), "Globalization in History: A Geographical Perspective", in Bordo, M.D., Taylor, A.M. and Williamson, J.G. (eds.), *Globalization in Historical Perspective*, Chicago: University of Chicago Press, 323-364.

Deane, P. and W.A. Cole (1962), *British Economic Growth 1688-1959*, Cambridge: Cambridge University Press.

Deaton, A. and Muellbauer, J. (1980), *Economics and Consumer Behaviour*, Cambridge; Cambridge University Press.

Dennison, T. and Ogilvie, S. (2014), "Does the European Marriage Pattern Explain Economic Growth?", *Journal of Economic History*, 74, 651-693.

Dincecco, Mark (2011), *Political Transformations and Public Finances: Europe, 1650-1913*, Cambridge: Cambridge University Press.

Dyer, C. C. (2012), 'Poverty and its relief in late medieval England. *Past and Present*, 216, 41-78.

Easterly, W., Kremer, M., Pritchett, L. and Summers, L.H. (1993), "Good Policy or Good Luck?," *Journal of Monetary Economics*, 32, 459-483.

Epstein, S.R. (2000), *Freedom and Growth: The Rise of States and Markets in Europe, 1300-1750*, London: Routledge.

Feinstein, C.H. (1972), *National income, Expenditure and Output of the United Kingdom, 1855-1965*, Cambridge: Cambridge University Press.

Feinstein, C.H. (1978), "Capital Formation in Great Britain", in Mathias, P. and Postan, M.M. (eds.), *The Cambridge Economic History of Europe, Volume VII: The Industrial Economies: Capital. Labour, and Enterprise, Part I, Britain, France, Germany and Scandinavia*, Cambridge: Cambridge University Press, 28-96.

Feinstein, C.H. (1988), "National Statistics, 1760-1920: Sources and Methods of Estimation for Domestic Reproducible Fixed Assets, Stocks and Works in Progress, Overseas Assets, and Land", in Feinstein, Charles H. and Sidney Pollard (eds.), *Studies in Capital Formation in the United Kingdom, 1750-1920*, Oxford: Oxford University Press, 257-471.

Feinstein, C.H. and Thomas, M. (2002), "A Plea for Errors", *Historical Methods* 35: 155-165.

Frank, A.G. (1998), *ReOrient: The Silver Age in Asia and the World Economy*, Berkeley: University of California Press.

Fukao, K., Bassino, J.-P., Makino, T., Paprzycki, R., Settsu, T., Takashima, M., and Tokui, J. (2015), *Regional Inequality and Industrial Structure in Japan: 1874-2008*, Tokyo: Maruzen Publishing.

Hajnal, J. (1965), "European Marriage Patterns in Perspective", in Glass, D.V. and Eversley, D.E.C. (eds.), *Population in History: Essays in Historical Demography*, London: Edward Arnold, 101-143.

Hanley, S.B. (1983), "A High Standard of Living in Nineteenth-Century Japan: Fact or Fantasy?", *Journal of Economic History*, 43, 183-192.

Hayami, A. (1967), "Keizai shakai no seiretsu to sono tokushitsu (The Emergence of the Economic Society and its Characteristics)", in Gakkai, S.K. (ed.), *Atarashii Edo Jidaizo o Motomete*, Tokyo: Toyo Keizai Shinposha.

Henriques, A. and Palma, N. (2020), "Comparative European Institutions and the Little Divergence, 1385-1800", CEPR Discussion Paper No. 14124 (revised version), https://cepr.org/active/publications/discussion_papers/dp.php?dpno=14124#.

Hindle, S. (2004), *On the parish? The micro-politics of poor relief in rural England c.1550-1750*, Oxford: Clarendon Press.

Huang, P.C.C. (2002), "Development or Involution in Eighteenth-Century Britain and China?: A Review of Kenneth Pomeranz's The Great Divergence: China, Europe and the Making of the Modern World Economy", *Journal of Asian Studies*, 61, 501-538.

Humphries, J., and Weisdorf, J. (2019), "Unreal Wages? Real Income and Economic Growth in England, 1260-1850", *Economic Journal*, 129. 2867-2887.

Jones, E.L. (1981), *The European Miracle: Environments, Economies, and Geopolitics in the History of Europe and Asia*, Cambridge: Cambridge University Press.

Karaman, K.K. and Pamuk, S. (2010), "Ottoman State Finances in European Perspective, 1500-1914", *Journal of Economic History*, 70, 593-629.

Krantz, O. (2017), "Swedish GDP 1300-1560: A Tentative Estimate", Lund Papers in Economic History; No. 152, Department of Economic History, Lund University, http://portal.research.lu.se/portal/files/21081639/LUP_152.pdf.

Krugman, P. and Venables, A.J. (1995), "Globalization and the Inequality of Nations", *Quarterly Journal of Economics*, 110, 857-880.

Kuznets, S. (1966), *Modern Economic Growth: Rate, Structure and Spread*, New Haven: Yale University Press.

Landes, D.S. (1969), *The Unbound Prometheus: Technological Change and Industrial Development in Western Europe from 1750 to the Present*, New York: Cambridge University Press.

Landes, D.S. (1998), *The Wealth and Poverty of Nations: Why Some are So Rich and Some So Poor*, London: Little Brown.

Lee, J.Z. and Wang, F. (2001), *One Quarter of Humanity: Malthusian Mythology and Chinese Realities*, Cambridge, MA: Harvard University Press.

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.

McCloskey, D. (1981), "The Industrial Revolution 1780-1860: A Survey", in Floud, Roderick and D. McCloskey (eds.), *The Economic History of Britain Since 1700, Volume 1: 1700-1860*, Cambridge: Cambridge University Press, 103-127.

McIntosh, M. K. (2012), *Poor relief in England, 1350-1600*, Cambridge: Cambridge University Press.

Maddison, A. (1988), "Ultimate and Proximate Growth Causality: A Critique of Mancur Olson on the Rise and Decline of Nations", *Scandinavian Economic History Review*, 36, 25-29.

Maddison, A. (2001), *The World Economy: A Millennial Perspective*, Paris: Organisation for Economic Co-operation and Development.

Maddison, A. (2010), "Statistics on World Population, GDP and Per Capita GDP, 1-2008 AD", Groningen Growth and Development Centre, http://www.ggdc.net/MADDISON/oriindex.htm.
Malanima, P. (2002), *L'economia italiana: dalla crescita medieval all crescita contemporanea*, Bologna: Il Mulino.
Malanima, P. (2009), *Pre-Modern European Economy: One Thousand Years (10th - 19th Centuries*, Leiden: Brill.
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. (2019), "Economic Consequences of State Failure; Legal Capacity, Regulatory Activity, and market Integration in Poland, 1505-1772", *Journal of Economic History*, 79, 862-896.
Malinowski, M. and van Zanden, J.L. (2017), "Income and its Distribution in Preindustrial Poland", *Cliometrica*, 11, 375-404.
de Moor, T. and van Zanden, J.L. (2010), "Girl Power: The European Marriage Pattern and Labour Markets in the North Sea Region in the Late Medieval and Early Modern Period", *Economic History Review*, 63, 1-33.
Mosk, C. (1980), "Nuptiality in Meiji Japan", *Journal of Social History*, 13, 474-489.
North, D.C. and Thomas, R.P. (1971), *The Rise of the Western World: A New Economic History*, New York: Cambridge University Press.
North, Douglass C., John J. Wallis and Barry R. Weingast (2009), *Violence and Social Orders: A Conceptual Framework for Interpreting Recorded Human History*, Cambridge: Cambridge University Press.
Palma, N. and Reis, J. (2019), "From Convergence to Divergence: Portuguese Economic Growth, 1527-1850", *Journal of Economic History*, 79, 477-506.
Parthasarathi, P. (1998), "Rethinking Wages and Competitiveness in the Eighteenth Century: Britain and South India", *Past and Present*, 158, 79-109.
Parthasarathi, P. (2011), *Why Europe Grew Rich and Asia Did Not: Global Economic Divergence, 1600-1850*, Cambridge: Cambridge University Press.
Perkins, D.H. (1969), *Agricultural Development in China, 1368-1968*, Chicago: Aldine.
de Pleijt, A.M. (2018), "Human Capital Formation in the Long Run: Evidence from Average Years of Schooling in England, 1300-1900", *Cliometrica*, 12, 99-126.
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, https://warwick.ac.uk/fac/soc/economics/seminars/seminars/conferences/venice3/programme/pfister_growth_venice_2011.pdf.
Pollard, S. (1981), *Peaceful Conquest: The Industrialization of Europe 1760-1970*, Oxford: Oxford University Press.
Pomeranz, K. (2000), *The Great Divergence: China, Europe, and the Making of the Modern World Economy*, Princeton: Princeton University Press.
Pomeranz, K. (2011), "Ten years after: responses and reconsiderations", *Historically Speaking*, 12(4), 20-25. Project Muse, https://muse.jhu.edu/login?auth=0&type=summary&url=/journals/historically_speaking/v012/12.4.coclanis.html.
Pomeranz, K. (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, https://nephist.wordpress.com/2017/06/06/the-data-we-have-vs-the-data-we-need-a-comment-on-the-state-of-the-divergence-debate-part-i/#comments.

Prange, S. (2011), “A Trade of No Dishonor: Piracy, Commerce, and community in the western Indian Ocean, Twelfth to Sixteenth century”, *American Historical Review*, 116, 1269-1293.
Pritchett, L. (2000), “Understanding Patterns of Economic Growth: Searching for Hills among Plateaus, Mountains and Plains”, *World Bank Economic Review*, 14, 221-250.
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), PhD thesis, IMT School for Advanced Studies, Lucca.
Saito, O. (2012), “The Stem Family and Labour Markets: Reflections on Households and Firms in Japan’s Economic Development”, *History of the Family*, 16, 466-480.
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.
Sivasubramonian, S. (2000), *The National Income of India in the Twentieth Century*, New Delhi: Oxford University Press.
Slack, P. (1988), *Poverty and policy in Tudor and Stuart England*, London: Longman.
Solar, P. (2021), “China’s GDP: Some Corrections and the Way Forward”, *Journal of Economic History*, (forthcoming).
Sng, T.-H. and Moriguchi, C. (2014), “Asia’s Little Divergence: State Capacity in China and Japan before 1850”, *Journal of Economic Growth*, 19, 439-470.
Solow, R.M. (1957), “Technical Change and the Aggregate Production Function”, *Review of Economics and Statistics*, 39, 312-320.
United Nations Industrial Development Organisation (various issues), *International Yearbook of Industrial Statistics*, Cheltenham: Edward Elgar.
Voigtländer, N. and Voth, H.-J. (2013), “How the West ‘Invented’ Fertility Restriction”, *American Economic Review*, 103, 2227-2264.
Voth, H.-J. (1998), “Time and Work in Eighteenth-Century London”, *Journal of Economic History*, 58, 29-58.
Voth, H.-J. (2001), “The Longest Years: New Estimates of Labor Input in England, 1760-1830”, *Journal of Economic History*, 61, 1065-1082.
de Vries, J. (1994), “The Industrial Revolution and the Industrious Revolution”, *Journal of Economic History*, 54, 249-270.
de Vries, J. (2008), *The Industrious Revolution: Consumer Behavior and the Household Economy, 1650 to the Present*, Cambridge: Cambridge University Press.
de Vries, J. and van der Woude, A. (1997), *The First Modern Economy: Success, Failure and Perseverance of the Dutch Economy, 1500-1815*, Cambridge: Cambridge University Press.
Walker, J.T. (2014), “National Income in Domesday England”, in Allen, M. and Coffman, D. (eds.), *Money, Prices and Wages: Essays in Honour of Professor Nicholas Mayhew*, Basingstoke: Palgrave Macmillan, 24-50.
Weber, M. (1930), *The Protestant Ethic and the Spirit of Capitalism*, London: Allen and Unwin.
Wrigley, E.A. (1985), “Urban Growth and Agricultural Change: England and the Continent in the Early Modern Period”, *Journal of Interdisciplinary History*, 15, 683-728.
Wrigley, E.A. (2010), *Energy and the English Industrial Revolution*, Cambridge: Cambridge University Press.
van Zanden, J.L., Buringh, E. and Bosker, M. (2012), “The Rise and Decline of European Parliaments, 1188-1789”, *Economic History Review*, 65, 835-861.

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.