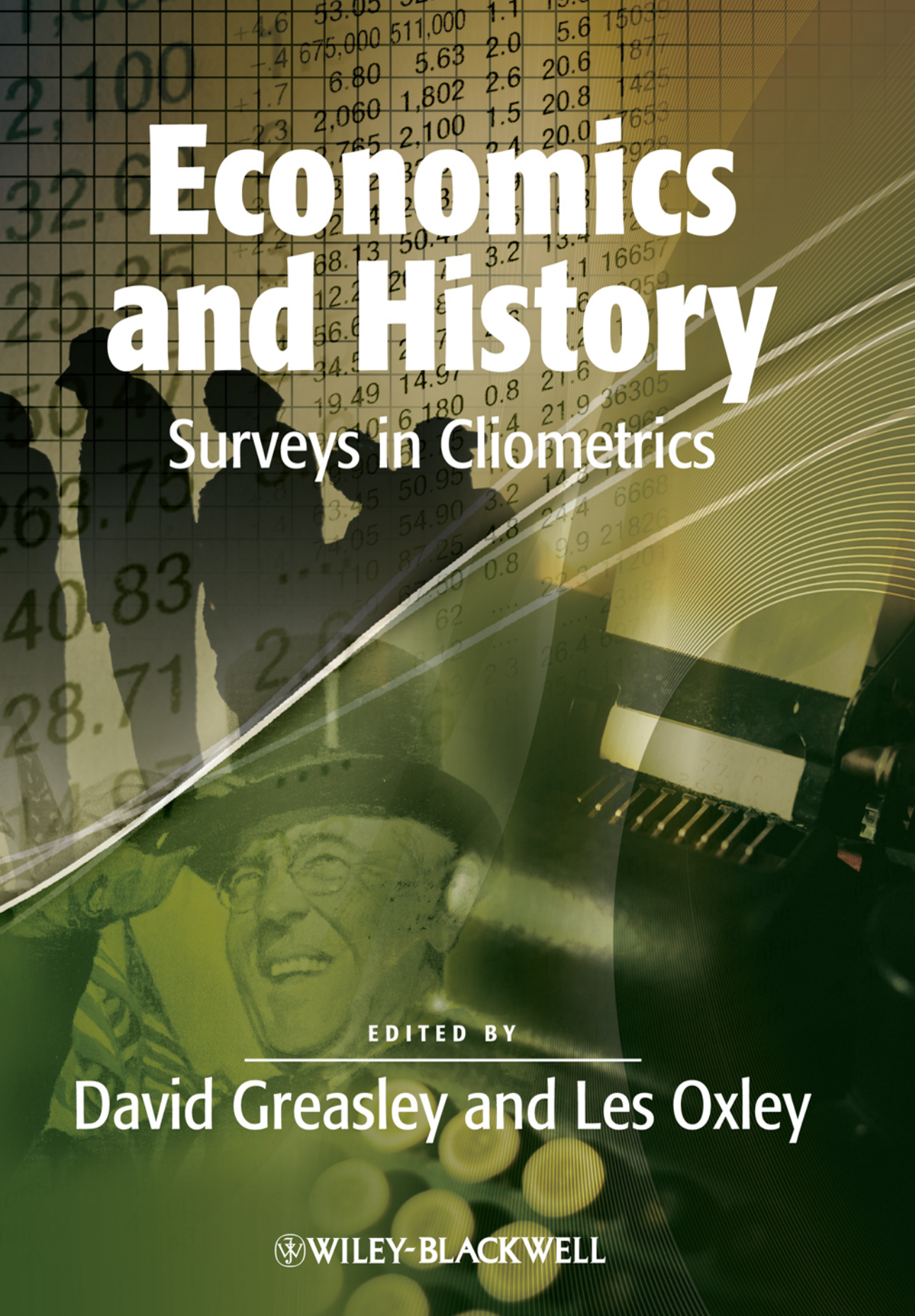
Economics and History
Surveys in Cliometrics
EDITED BY
David Greasley and Les Oxley
WILEY-BLACKWELL

This page intentionally left blank

Economics and History

Economics and History

Surveys in Cliometrics

Edited by David Greasley and Les Oxley

WILEY-BLACKWELL
A John Wiley & Sons, Ltd., Publication

This edition first published 2011

Originally published as a special issue of the *Journal of Economic Surveys* (Volume 24, Issue 5)

Blackwell Publishing was acquired by John Wiley & Sons in February 2007. Blackwell's publishing program has been merged with Wiley's global Scientific, Technical, and Medical business to form Wiley-Blackwell.

Registered Office
John Wiley & Sons Ltd, The Atrium, Southern Gate, Chichester, West Sussex, PO19 8SQ, United Kingdom

Editorial Offices
350 Main Street, Malden, MA 02148-5020, USA
9600 Garsington Road, Oxford, OX4 2DQ, UK
The Atrium, Southern Gate, Chichester, West Sussex, PO19 8SQ, UK

For details of our global editorial offices, for customer services, and for information about how to apply for permission to reuse the copyright material in this book please see our website at www.wiley.com/wiley-blackwell.

Library of Congress Cataloging-in-Publication Data

Economics and history : surveys in cliometrics / edited by David Greasley, Les Oxley.
p. cm. – (Surveys of recent research in economics ; 2)
Includes bibliographical references and index.
ISBN 978-1-4443-3780-8 (pbk.)
1. Economic history. 2. Econometrics. 3. History–Methodology. I. Greasley, David. II. Oxley, Les.
HC26.E266 2011
330.01'5195–dc22
2011013987

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

This book is published in the following electronic formats: ePDFs (9781444346695); Wiley Online Library (9781444346725); ePub (9781444346701); Kindle (9781444346718)

Set in 9/10.5 pt in Times by Aptara, Inc.

1 2011

CONTENTS

This page intentionally left blank

Notes on Contributors

Samuel Allen	Virginia Military Institute
Price Fishback	University of Arizona
Jonathan Fox	Max Planck Institute of Demographic Research
David Greasley	University of Edinburgh
Timothy J. Hatton	University of Essex and Australian National University
Kris Inwood	University of Guelph
Tim Leunig	London School of Economics
Brendan Livingston	University of Arizona
Les Oxley	University of Canterbury
Leandro Prados de la Escosura	University Carlos III, Madrid
Evan Roberts	University of Minnesota

1

CLIO AND THE ECONOMIST: MAKING HISTORIANS COUNT

David Greasley and Les Oxley

Cliometrics has been with us for half a century. At least it was in 1960 that the word itself was coined by Stanley Reiter to describe a style of quantitative history that linked clio, the muse of history with measurement or more succinctly metrics. Three years earlier a joint session of the Economic History Association and the National Bureau of Economic Research Conference on Income and Wealth was held in Williamstown, Massachusetts and many practitioners date the birth of cliometrics to those meetings. The task issue of the *Journal of Economic History* in 1957 was headed the integration of economic theory and economic history and contained some of the fruits of the pioneers' discussions and a summary of the proceeding by Simon Kuznets.

Regular workshops of cliometricians date from 1960 and the discipline laid strong foundations over the following decade, most especially in the USA. Fogel (1964) published *Railroads and Economic Growth: Essays in Econometric History*, which stimulated intensive methodological debate among historians worldwide. Very quickly the British Economic History Society commissioned a paper by Fogel 'The new economic history: its findings and methods' which was published in the *Economic History Review* in 1966. The 'new economic history' and 'econometric history' were at that time alternate labels for cliometrics.

The explicit connecting of economics with economic history was the hallmark of cliometrics as it developed in the USA. Reiter himself was a mathematical economist whose work included collaboration with economic historian Hughes to produce a paper, 'The First 1945 British Steamships' (Hughes and Reiter, 1958) published by the *Journal of the American Statistical Association* in 1958. That paper, along with a celebrated paper of two economists, Alfred Conrad and John Meyer, 'The economics of slavery in the Antebellum South', which also appeared in 1958 in the *Journal of Political Economy* are often associated with the birth of cliometrics (Conrad and Mayer, 1958). In a wider context the growth of cliometrics drew on the longer established traditions of quantitative economic history, and on concurrent developments in the social sciences and computing during the 1960s.

Economics and History, First Edition. David Greasley and Les Oxley

Cliometrics was sufficiently well established by the early 1970s for Penguin Modern Economics Reading to include *New Economic History*, edited by Temin (1973). His introduction to the *New Economic History* set out cliometrics' place within the wider discipline of economics by highlighting the distinctions between the classical and the historical economics schools which emerged in the 19th century. For Temin, the new economic history differed from the old by being a member of the classical economics family, not the historical economics clan; indeed his anthology introduced new economic history as a form of applied neo-classical economics. Early examples of Keynesian cliometric-style research can be found, including Brown's (1956) assessment of New Deal spending in the USA and the work of Matthews (1954) and Rostow (1948) on investment and British economic growth, but these were exceptions.

Chiefly the early cliometricians reinterpreted economic history through the lens of the neo-classical economist. Although in the USA the initial controversies surrounded the indispensability of railroads and the rationale for investing in slaves, in Britain the chief battleground between the old and new economic history centred on gauging the performance of Victorian entrepreneurs, and most especially on their choice of technology, see Lee (1977). A myriad of industry case studies appeared which carefully specified the circumstances of technical choice and these typically redeemed the reputations of Victorian entrepreneurs. At the macroeconomic level McCloskey (1970) emphatically denied Victorian Britain failed, by utilizing estimates of total factor productivity to show efficiency growth was on a par with that of the USA.

The heat of the early debates, the label of the new economic history, and the controversies surrounding counterfactuals and applying neo-classical economics to re-evaluate long-standing historical questions sometimes disguises the wider foundations of cliometrics. In that wider setting several intellectual traditions shaped the emergence and the subsequent evolution of cliometrics. The ones that now stand out include:

1. Quantitative history and most especially the construction of historical series of prices, wages and incomes, which have long traditions dating back to at least the 19th century.
2. Quantitative social science of the 1950s and 1960s which placed emphasis on empirical research, and the use of census and mass survey data. Sociologists for example, pioneered the use of sampling and significance testing to handle large volumes of social data, see Hudson (2000). The manipulation of large data sets was facilitated by concomitant developments in computing.
3. Econometric testing, including of macroeconomic business cycles models which developed strongly in the 1930s; see Morgan (1990). Tinbergen's (1939) *Statistical Testing of Business Cycles* published in 1939 drew on classical statistical methods but also set out the best practices for applied econometrics which eventually became embedded in cliometrics.
4. Cliometrics has been an evolving discipline, with its shifts in direction and emphasis in part reflecting new developments in economic theory. Most

importantly the return of growth theory to centre stage in mainstream economics and the development of endogenous growth models in the 1990s enabled cliometricians to reduce their reliance of neo-classical models and measures of residual productivity, see Greasley and Oxley (1997).

5. The evolution of cliometrics has also been strongly influenced by new developments in econometrics methods, most especially in the analysis of non-stationary time series following the work of Engle and Granger (1987).

In the following Section I, the five key forces which shaped the emergence and evolution of cliometrics are discussed within a survey of the historiography. Then in Section II the six chapters which form the substance of this volume are introduced and placed in the context of the wider discipline. Finally Section III concludes by considering what is next for cliometrics.

I

1. Quantitative History

The construction of long historical time series of key economic variables, most especially of wages, prices and human well-being has a long pedigree. In Britain the endeavours of Bowley (1900) and Wood (1910) stand out and their works on earnings and prices have been augmented by Beveridge (1939), Phelps Brown and Hopkins (1955), and more recently by Williamson (1995), Allen (2001) and Clark (2005). In France, the Annales School from the 1920s promoted the use of long run statistical series of population, prices and production to understand the past. The wider European historiography of prices and wages has been reviewed by van Zanden (1999). The early British studies of Bowley, Wood, and Phelps Brown and Hopkins had the objective of understanding shifts in living standards among particular groups of workers in a single country. In contrast Williamson and Allen incorporated purchasing power parities to compare wage levels across countries. Aside from allowing international comparisons of well-being over long time periods (dating back to the 13th century in the cases of England and Italy) these data have been used to consider issues of income and productivity convergence including during the first globalization 1870–1914. In recent years the international database on real wages has expanded to cover many parts of the world including Asia (Allen *et al.*, 2010) Latin America (Bertola and Porcile, 2006) and Australasia (Greasley and Oxley, 2004).

Estimates of production, national income and GDP have a historiography that long pre-date the contemporaneous data reported by governments after 1945. The history of national income accounting has been admirably surveyed by Maddison (2004) including the contributions of the 20th century pioneers, Colin Clarke and Simon Kuznets. In the case of British data Hoffman's (1955) estimates of industrial production deserve additional mention; they date from the 1930s and provide annual series for years from 1700. These data provided a platform for the subsequent estimates of Deane and Cole (1966), Feinstein (1972) and Crafts and

Harley (1992). Maddison's (2001) own GDP estimates incorporated purchasing power parity benchmarks to facilitate international comparison, and his wider discussion of alternative purchasing power parity approaches and the associated data sets illuminate the central issues surrounding the modern analysis of comparative economic growth.

Quantitative history built upon a great variety of scholarship. Political arithmetic, including Petty's constructions of national resources and capacity dates from the 17th century, and his work was followed by King's estimates of English national incomes in 1688, the Victorian Statistical Movement (see Cullen, 1975) and an explosion of governmental statistics in the 20th century. Historians, long before the birth of cliometrics, were avid measurers and their work, in addition to that on prices and wages, included the history of industries (Nef, 1932 and Wadsworth and Mann, 1931), agriculture (Rogers, 1866–1902), overseas trade (Schlote, 1932), overseas investment (Jenks, 1927), public finance (Hicks, 1938) and money and banking (Sayers, 1936). Quantitative approaches to economic history were flourishing before World War II, and subsequently gathered pace – see for example, Rostow (1948), Lewis (1949), Cairncross (1953), Matthews (1954), Thomas (1954) and Saul (1954). A decade later, around the time of cliometrics birth leading economists were also using long runs of historical data; notable examples include Phillips (1958) and Friedman and Schwartz (1963). Measuring was not novelty for historians when the pioneer cliometricians held their first workshop at Purdue University in 1960. The cliometricians were able to draw upon a long tradition of history by numbers as one ingredient in their new economic history.

2. Quantitative Social Science and Computing

Although economic history had long been a quantitative discipline, by the 1960s numbers gained greater prominence in history more generally. In part historians became more interested in the masses and in social as well as economic changes, as distinct from the history of elites, diplomacy and great men, see Hudson (2000). Summary statistics were a natural corollary to the history of the masses. Concurrent development in computing and the social sciences encouraged the growth of quantitative history. By the early 1970s introductions to quantitative methods for historians appeared and included practical guidance on computing. One well-known text, Floud (1973) noted that calculators which add and multiply could be bought for around £20, but those able to divide cost £35 (around £315 or £512 in 2009 prices, respectively, using the RPI and average earning to measure inflation, see www.eh.net, *Measuring Worth*). He also provided the details of a FORTRAN programme for calculating mean values.

The wider growth of the social sciences in the 1960s, most especially sociology and political science, paralleled the rise of positive economics. Often the textbooks spanned disciplines, for example, that of Blalock (1960), though written for sociology students and was widely used by economic historians. Sociologists pioneered the analysis of mass survey data using sampling theory and significance tests. Sociologists' work on families often overlapped with demographic history as

well as social history more generally. Wrigley's (1966) article on family limitation in pre-industrial England shares common ground with the approaches of the sociologists and presaged influential work on English demographic history. Urban historians also made use of census data; Anderson (1971) utilized a sample of the 1851 UK Census to analyse family structure and migration patterns in Preston. Rather differently political scientists paid most attention to voting behaviour and historical analogues include Aydelotte (1963) and Reading (1973).

Cliometrics as it emerged in the 1960s was part of wider movement among the social sciences and history towards quantification. The cliometricians believed their new methods would bring clear answers to long standing historical debates. A similar mood of optimism was exuded by the social sciences, most especially in their ability to improve human well-being via public policy. Most obviously the new (Keynesian) economics held sway in the USA during the 1960s, reflecting a growing confidence among the practitioners, policy makers and politicians in the real-world utility of the social sciences, see Samuelson and Solow (1960) and their exposition of the Phillip's curve using US data. In essence cliometrics as it developed in the 1960s was a form of social science history which rested most especially on the methods and theories of economists.

3. Econometrics

Though sometimes labelled econometric history, very little use was made of regression methods by the pioneer cliometricians during the 1960s. Surveying the state of cliometrics at the end of first decade Wright (1971) concluded the new economic history had been distinguished by its use of economics not econometrics. Temin's (1973) anthology included only one paper that used regression methods, and a similar collection edited on behalf on the Economic History Society by Floud (1974) included only two. Even during the 1970s econometric estimation was not commonly employed by cliometricians. Reflecting on the achievements of the cliometrics school McCloskey (1978) highlighted that expertise with economic and most especially price theory was the defining skill of its practitioners. A decade later the same author's *Econometric History* (McCloskey, 1987) argued that that title originated as a verbal ploy – suggesting it was an attempt by cliometricians to appropriate the prestige of econometrics. Thus he reminds us that Fogel's seminal, and subsequently Nobel-prize winning work on railroads was subtitled *Essays in Econometric History*, although it contained only two elementary fitted straight lines to scatters of points.

Econometric history initially had very little to do with econometrics but made much use of economics and quantification. Gradually the use of regression methods assumed more prominence. The progression was mirrored in the papers latterly published in the *Journal of Economic History* including Gallaway and Vedder (1971) who utilized multivariate regression to show pull forces dominated the trans-Atlantic migration of 1860–1913, and Ford (1971) who used similar methods to explain how Argentine pull forces attracted British capital in 1880–1914. The shift to a style of econometric history that had clearer affinity with econometrics gathered

pace during the 1980s as *Explorations in Economic History* became the house journal of cliometrics under the long and distinguished editorship of Larry Neal. Econometric estimation became the norm for *Explorations* papers, including in the areas of, for example, enterprise and technical choice where the early cliometricians had previously eschewed the use of econometrics, see Greasley (1982).

Thus by the 1980s the style of econometric history commonplace in *Explorations* had antecedents in the practices of applied econometrics pioneered by Tinbergen in the 1930s. In contrast cliometrics' other alternative label, the new economic history was beginning to look jaded 30 years on from the Williamsburg meeting. A later survey of the discipline by Crafts *et al.* (1991) associated the 1980s with a second phase of new economic history. In part these editors were reflecting on the richer range of theoretical perspectives deployed by cliometricians, ones that often did not always lead to the typical conclusion of first-generation work as reported by McCloskey (1978) 'The market, God bless it, works'. They also noted the heavier reliance on more sophisticated quantitative methods, with the authors in their anthology using autoregressive integrated moving average (ARIMA), vector autoregression (VAR), Logit and translog production functions. Cliometrics matured and became more eclectic in the 1980s. The virtues of precise specification and measurement demanded by the pioneers were sustained, but the theoretical and empirical models of cliometricians became both more econometric and more sensitive to the minutiae of history.

4. Economic Theory

The reinterpretation of economic history by the pioneer cliometricians rested primarily on applying the logic of economics to long standing historical issues. To a large extent the style of that economics was neo-classical. The impact was profound, most especially in the reinterpretation of US economic history. Even a cursory glance at standard US economic history textbooks, for example, Atack and Passell (1994) illustrate how explicit economic thinking transformed the understanding of national growth, westward expansion, trade, capital market integration, transport innovations, industrialization, slavery and economic fluctuations. The new economic history was also an export product and McCloskey (1987) once articulated the case for *Pax Cliometrica*. The British resisted, tempered in part by the greater use of insights from traditional historiography, but sometimes endorsed the product. Interestingly only 4 of the 10 papers in Crafts *et al.* (1991) were by British scholars. Yet progress had been made. All 14 papers in Temin's (1973) anthology were written by Americans.

Some critics argued that the pioneering cliometrician's revisionism amounted to an imperialism of elementary economic theory. Certainly the apparatus of neo-classical economics did not offer much insight into historical-institutional change. Yet the aspirations and agendas of cliometricians evolved, and they came to include tendencies towards greater eclecticism. Trust, uncertainty, creativity, credibility, institutions, agency and informational asymmetry are concepts that became incorporated in cliometricians' theoretical tool kits; for examples see O'Rourke

(2007), Greasley, Madsen and Oxley (2001) and Mitchener (2005). Cliometricians also re-invigorated long established theoretical perspectives, including those of Hechsher and Ohlin, and deployed them with new vigour and purpose, see Williamson (2002). Most dramatically, the return of growth theory to centre stage in main stream economics provided new opportunities for cliometricians to engage with and utilize the ideas of growth theorists.

Barro *et al.* (1995) argued that the disassociation in the neo-classical paradigm between theory and historical experience led to the virtual demise of research on economic growth by the 1970s, although economic historians, for example, Matthews *et al.* (1982) continued to highlight the importance of residual productivity. The new endogenous growth models, including those of Rebelo (1991) and Romer (1986) were able to explain continuing growth without recourse to exogenous technology, initially by showing that human capital formation might offset diminishing returns. A second generation of endogenous models paid more attention to the forces promoting technological progress by considering the private rewards for innovation and the possibility of public knowledge spillover, see Aghion and Howitt (1992). More recently unified theories which offer two and three stage interpretations of long run economic growth to integrate the Malthusian world of stagnant output per capita with the modern era of sustained output per capita growth have been constructed by Galor and Weil (2000) and Hansen and Prescott (2002). Concomitantly empirical analyses of economic growth surged from the 1990s.

Cliometricians have contributed much to the empirics of economic growth following the rise of endogenous theories, most especially in their extending of the analyses to periods before 1945 and by their supply of data. In the key area of human capital formation Goldin (2001), O'Rourke and Williamson (1999) and Baten and van Zanden (2008) have shown the value of historical data. The role of geography and natural resources in economic development, including issues of agglomeration, the resource curse and technology are further areas where the work of economists and cliometricians coincide. Lucas (2001), Krugman (1995) and Baldwin's (1999) analyses utilizing the new economic geography have clear cliometric analogues – for example, Keay (2007), Crafts and Venables (2001) and Greasley and Oxley (2010a). Sachs and Warner's (2001) analysis of the resource curse rested on post-1970 data, and scrutiny of their hypothesis with longer runs of data, for example, by Wright and Czelusta (2003), Greasley and Madsen (2010) and Huff (2002), have tempered their conclusions.

Among growth theories a schism exists between perspectives highlighting, respectively, the forces of geography and importance of institutions in economic growth. Cliometricians have a special place in the analysis of institutions, following the pioneering work of North (1990). Both theorists and empirical economists have built upon North's work, see Parente and Prescott (2000) and Acemoglu *et al.* (2002). The primacy of institutions in economic growth though has been challenged by cliometricians, notably by Sokoloff and Engerman (2000). The institutions versus geography in economic growth debates illustrate how the divisions between cliometricians and economists have blurred over the past decade. Cliometricians

typically have constructed the data and the economists the theory, but the empirics of growth has become a common arena. A greater willingness on the part of economists to engage with historical data following the new developments in growth theory has been an important force in the evolution of cliometrics.

5. Time Series Methods

Cliometricians had by the 1980s became regular users of econometric methods. Some of the key debates in the second phase of new economic history, for example, those seeking to explain the rise in unemployment between the world wars made use of time series data and tests of statistical significance using regression methods, see Benjamin and Kochin (1979). Coincidental to the growing use of regression methods by cliometricians was a greater awareness among econometric theorists that classical regression analysis utilizing time series might lead to spurious results if the data series have trends. Engle and Granger (1987) pioneered the new methods of cointegration in an attempt to establish more robust long run relationship among time series variables. Their methods gained acceptance among cliometricians; for example, O'Grada (1993) provides an early new economic history example of the use of cointegration methods. Tests of Granger causality are a natural corollary to cointegration methods, and these were also utilized by cliometricians, see for example, Greasley and Oxley (1998).

Much of the initial work by cliometricians using the new time series methods was univariate analysis. Describing the trends and cycles of historical data long predated cliometrics. For US data the work of Kuznets (1930) and Burns (1934) stand out and Hoffmann (1955) provides an admirable survey of British research. The new time series methods provided opportunities for re-appraising long term production trends where the underlying data are difference stationary. The new methods were used to shed new light of key historical debates including the British Industrial Revolution and the Victorian climacteric, see Crafts *et al.* (1989) and Greasley and Oxley (1994). Following the work of Perron (1989) on structural breaks, the effects of major shocks on historical production trends were also investigated within a modern time series framework, for example, Greasley and Oxley (1996) analysed the First World War's effect on British industrial growth.

In a multivariate context the new time series methods by allowing the investigation of common trends among times series data contributed to the debates surrounding modern economic growth, most especially in relation to identifying income convergence among groups of countries. Times series tests of convergence typically find against multivariate convergence, see Bernard and Durlauf (1995) but Greasley and Oxley (1997) report time series evidence of convergence clubs. The method of common trends has also been used to identify developments blocks or groups of leading industries. Enflo *et al.* (2008) combined cointegration and causality analysis to gauge the role of electrification in Sweden's industrial growth, and Greasley and Oxley (2000) investigated the leading sectors of the British Industrial Revolution with similar methods.

II

Each of the chapters in this volume illustrates at least some of the foundations of cliometrics elucidated in the previous section. Cliometrics, as we have shown, has been an evolving discipline and the contributions reviewed here also help to show how the subject developed over the past half century. Most importantly each chapter surveys and builds upon a key area of cliometrics. Leunig (2010) takes us to the birth of cliometrics in his reflections on 'social savings', a concept introduced by Bob Fogel at the First Cliometrics Workshop at Purdue University in 1960 in a preliminary discussion of his later book, *Railroads and US Economic Growth*. Leunig takes issue with the view that the pioneer cliometricians simply applied economists' concepts to reinterpret history. In the case of social savings Fogel constructed a new concept to measure the consequences of technological change, and then applied the idea to overturn traditional historians' ideas on the importance of the railroads.

The concept of social savings built upon familiar ideas of marginal costs and the circumstances under which costs and prices would equate. Fogel formulated the concept to gauge the impact of new technology on economic growth, taking account of both the extent of a new technology's use and its additional value over previous technology. Social savings, measured as the gap between the supply price (of transport) made by the old and new technology, and the quantity of transport supplied (in 1890) was a simple yet enormously powerful device for gauging the importance of improved transport technology to US economic growth. In essence, because the US economy had good second best transport alternatives, the gains from railroads were shown to be less than traditional historians had believed, indeed Fogel's key conclusion was a denial that railroads were indispensable in US economic development.

Leunig performs valuable service in setting out the connections between social savings and alternative measures of gauging the welfare gains from a new technology. He highlights that the social savings from introducing improved technology equate identically to a shift in total factor productivity. Pioneer cliometricians, see McCloskey (1971), made much use of the price duals of production functions to measure total factor productivity. Fogel (1979) eventually set out precise definitions of social savings, but his wider work, including that with Engerman on industrial growth and slavery shows their understanding of production functions, the price dual and how these concepts can be used to measure efficiency and industrial growth, see Fogel and Engerman (1969, 1974). Leunig also explains why social savings do not usually equate to economists' standard measure of welfare, consumer surplus or with the results of growth accounting. Usually (and depending upon the shape of the demand curve) the rise in consumer welfare from improved technology will be lower than the social saving, and the gaps may be large when technological progress leads to large price falls and big output gains.

By setting out and clarifying the various measures for gauging the impact of new technology Leunig shows why cliometricians have reported diverse social savings

results. He also surveys the wider use social saving, including those outside the railroad arena, and shows the potential for further use especially when the data needed to estimate consumer surplus are missing. Leunig is cautious about the likely growth of social savings studies, but while case studies of social savings are comparatively few, those estimating total factor productivity are legion. The distinctions and similarities between measures consumer surplus, social savings and total factor elucidated by Leunig provide a salutary reminder of the need for cliometricians and economists to specify carefully their purposes and methods.

The chapters of Inwood and Roberts (2010) and Prados (2010) illustrate and extend the long-standing traditions of quantitative history. Measuring human well-being has been an enduring concern among quantitative historians, and these chapters show how cliometricians are pushing forward the boundaries of the debates. Much of the early debates on living standards, for a summary see Taylor (1975) utilized real wage data, sometimes augmented by information on consumption per capita and life expectancy. The use of stature as a measure of well-being in history dates from the 1970s, see Engerman (1976) and Floud and Wachter (1982). The initial motivation of the stature studies was to provide for measurement of well-being for periods and populations (or sub-groups of populations including women and children) with no or at best dubious income data. Increasingly though anthropometrics has been seen as a credible and possibly superior measure of well-being, given its potential to reflect both an individual's material inputs and their usage of that sustenance, see Steckel (2008).

In their survey Inwood and Roberts (2010) highlight the value of explicit longitudinal studies which link early life conditions with later life health and longevity. They also review the myriad of studies which used estimates of stature from samples of populations at different points in time. The early stature studies typically utilized historical data from USA and Europe, but later studies had a wider geographical range, and Inwood and Roberts usefully draw attention to the conflicts with traditional income-based and the stature studies of living standards in history. Thus far explicit longitudinal historical studies, which chart early life and occasionally in utero (usually measured by birth weight) experiences with later life health and income outcomes have been limited, and Inwood and Roberts show clearly the potential value of cliometric work of this type.

In their survey they set out the key findings of modern (longitudinal) anthropometric studies, most especially Waaler (1984), and review the few parallel historical studies, highlighting the prospects for cliometric research. They consider both height and weight-body mass indexes and set out the key modern, essentially post-1945, research finding of the links to health, morbidity and mortality. Thus far parallel historical studies are small in number, and chiefly utilize data arising from research using US Civil War army records, see Costa (1993). However the potential for historical research does not simply arise from cliometricians utilizing the growing knowledge of the health sciences to construct better-informed history. Cliometricians, Inwood and Roberts argue, have the potential to make a particularly important contribution in documenting how the shape of the body mass–mortality relationship has changed across cohorts, periods and countries to provide a useful

corrective to the perspective of some medical literature that appears to be searching for a stable or universal biological relationship.

Leandro Prados also draws and builds upon modern research, in his case on the United Nations Development Program's *Human Development Reports* (1990–2009) to construct new historical data on human development. Initially Prados reviews synthetic indicators of well-being, including the UN's Human Development Index (HDI) which has been published periodically since 1990. The HDI combines information on income, life expectancy and education in a composite index of development. Usefully Prados analyses the construction and criticisms of these data: he reviews the formulation of the individual series and discusses the merits of how income, longevity and education are combined. The value of synthetic indexes of development has been heavily criticized; see for example, Dowrick *et al.* (2003) and Pardos's discussion fully reflects the doubts surrounding the utility of the HDI. His main purpose however is to provide an improved HDI (IHDI).

The UN HDI provides a more optimistic indicator of developing countries well-being than measures of income per capita. Indeed Prados notes the tension between the pessimistic tone of the UN *Human Development Reports* and the more optimistic impression shown by the HDI. By including life expectancy, which grows relatively quickly in developing countries since 1945, HDI comparisons show developing countries performance in better light than do GDP per capita comparisons. Prados takes the view that the tension in part arises from defects in the construction of the HDI and he proposes a new measure which both adopts multiplicative weights for the three elements and, most importantly, new criteria for estimating the longevity and education components.

Prados utilizes the achievement function of Kakwani (1993), where an increase in the standard of living of a country at a higher level implies a greater achievement than a similar increase at a lower level. In particular for the social elements of the HDI, life expectancy and education, Prados derives the estimates with a convex achievement function, following Kakwani (1993), although the same procedure is not used for income. Thus, for example, in the case of life expectancy a gain at higher levels is weighted more heavily in the IHDI. Further by adopting a multiplicative aggregation of the three elements Prados is able to decompose the contributions of income, longevity and education in shaping the contours of the IHDI.

The results are striking, over the period 1870–2005 the IHDI rose by 1.4% p.a. compared to 0.9% p.a. for the HDI. The most important driver of the rise in the HDI has been the rise in life expectancy. However in comparison to the HDI the IHDI shows systematically lower levels of human development for developing countries. In the context of the conventional UN *Human Development Report* categories – 'low' is defined as <0.5 and high as >0.8, the IHDI mean level of development in 2005 at 0.455 falls in the low category, whereas the HDI shows a value of 0.711, close to the high category. Overall Prados argues that actual levels of development today are further below potential levels than the UN data show, and that greater investment in education and in improving life expectancy are, on the basis of the IHDI estimates, the route to improvement.

The contributions of Hatton (2010) and of Fishback *et al.* (2010) provide exemplary examples of the growing maturity of cliometrics. Fishback *et al.* provide a detailed survey of cliometric research into US income maintenance programmes, highlighting the patchwork, state and local level provision. They perform valuable service in gauging the overall level of US provision given the myriad and of diversity of the schemes, and they report it has been surprisingly high. Early cliometric research was sometimes criticized for a lack of sensitivity to the minutiae of historical experience, Fishback *et al.*'s survey show that the painstaking creation of historical data is now a hallmark of cliometrics.

Usefully Fishback *et al.* set the scene by articulating how the patchwork system developed and how expenditure grew. Five categories of welfare provision are considered; workers' compensation, mothers' pension, old age assistance, aid to the blind and unemployment insurance; and in each case the data of state and Federal provision is identified. These data provide a basis for analysing the geographic variation in spending and the extent to which state and city level differences persisted, including during the era of greater Federal spending from the 1930s. Fishback *et al.* also review why spending varied across states, and report new results on the political economy of unemployment compensation for the years 1940–2000, which shows higher spending persisted in some states irrespective of income and political shifts. Finally, these authors survey the cliometric literature which has gauged the impact of the various welfare programmes, highlighting that the effects spanned widely for example, to accident, crime, migration, wage and divorce rates and to the macro economy.

Cliometricians have always shown interest in gauging the effects of public policies. In his introduction to the *New Economic History*, Temin (1973) noted assessing government policies as one of the three key areas of the discipline (the other two he suggested were economic growth and economic institutions). The areas of policy Temin mentioned were, banking, land, transport subsidies and tariffs. Welfare policies were not mentioned. Fishback *et al.*'s survey illustrates how the boundaries of cliometrics have expanded over the past half century. The range of issues has grown, and approaches have become eclectic, with the impacts of public policies extended to consider a greater range of economic and social variables. Methods of analysis of have also changed substantially. Pioneer cliometricians made little use of econometrics. Coincidental with the rise of new time series methods from the 1990s was a growth in panel data estimation, which exploited both the cross-sectional and time elements of data. The dominant method of analysis revealed in the survey of Fishback *et al.* is panel data econometrics.

Tim Hatton's survey shows how a key area of cliometric research, the study of international migration, has evolved over the past 40 years. He highlights that the cliometrics of international migration has borrowed extensively from the parallel literature in economics, but that historical research utilizing pre-1914 data, when migration was essentially unfettered, has informed modern debates on the motives for and the effects of migration. Historical analyses of the Atlantic migrations were well established before the cliometrics revolution, and included the pioneering work of Jerome (1926), which argued migrants were pulled to the USA in numbers

related to the business cycle. Ferenczi and Wilcox (1929) compilation of migration statistics provides an admirable early example of quantitative history. Pioneer cliometricians, including Gallaway and Vedder (1971) contributed the long standing debates surrounding pull and push forces in the Atlantic migrations and Pope (1968) considered British Empire migration more generally.

Interestingly it was the second-generation new economic historians including Hatton (1995) himself that placed migration decisions within coherent economic models which linked migration to expected future incomes from going or staying. Here cliometrics drew of the work of economists, but much extended their empirical boundaries. Parallel work constructing databases of international real wages; see especially Williamson (1995) with data series for years from the 1820s greatly enriched the understanding of international migration. These data were instrumental in advancing the debates of why European countries had varying out migration rates before 1914, and in gauging the impact of migration on incomes in the source and destination countries.

Computable general equilibrium (CGE) models have been an important feature of the cliometric analysis of the national wage and income effects of the mass Atlantic migrations before 1914. These models, as Hatton and Williamson (1998) show, allowed for the analysis of a richer array of migration effects, beyond those previously gauged, for example, by postulating counterfactual labour force changes and labour demand elasticities to estimate migration's effects on real wages. Thus CGE models have been used to gauge migration's effects on economic structure and trade, and to show how incorporating capital mobility influences the estimated migration–wage nexus. The cliometrics of migration provides excellent illustration of how the ideas of economists have been utilized but also augmented by economic historians using innovative methods and newly constructed data to provide sharper insights into key issues, including those of public policy and migration controls.

Greasley and Oxley (2010b) review recent development in time series methods and explore their use in cliometric research. Cliometricians, given their natural affinity with analysing long run data, have more to gain than most from time series analysis. Greasley and Oxley provide simple explanations of the potential and the pitfalls of using time series data and survey the tests now available to guide the best practice use of time series methods. Second-generation new economic historians made increasing use of classical regression methods with time series data in the 1980s, which made their findings vulnerable to the criticisms of Granger and Newbold (1974) that apparently significant relationships among times series variables might be spurious. Greasley and Oxley, in addition to illustrating the pitfalls, show how new methods of time series, including cointegration and causality testing, provide enormously powerful tools for understanding long run economic change.

The time series methods they illustrate are multi-faceted and range through uni-, bi- and multivariate and panel data techniques. These methods are now widely utilized and Greasley and Oxley gauge the extent of their use and the type of application by surveying the papers using time series methods published in *Explorations in Economic History* and *Cliometrica* since 2000. To illustrate and

explain the methods they draw on their earlier research, including that used to identify structural changes and causes of the Industrial Revolution. Further, they explain how cointegration methods provide a basis for understanding the common features of times series, and show how issues of convergence and identifying the key drivers of economic change can be observed using these methods.

In addition to using their previous research to explain time series methods, Greasley and Oxley also report new research finding based upon recent developments in time series econometrics. In particular they show how test of multiple regime shifts proposed by Leybourne *et al.* (2007) can help identify the alternating stochastic properties of British industrial output and thus on the characteristics of the Industrial Revolution. They also explore how the structural time series model approach of Harvey (1989) can be used to help understand the trends and cycles in very long run data, illustrating the methods by analysing English real wage since 1264. Finally, Greasley and Oxley consider the potential of methods presently at the frontier of time series econometrics including the analysis of mildly explosive processes, see Phillips and Yu (2009) which may help the understanding of bubbles, and graphical modelling and its implications for causality testing.

III

The reconnecting of economics and economic history was at the heart of cliometrics as it emerged around 1960. In 1983 the Cliometric Society was formed and continued the tradition of annual cliometrics workshops. The US meetings are now augmented by World Congresses of Cliometrics. The Cliometric Society defines itself as an academic organization of individuals interested in the use of economic theory and statistical techniques to study economic history. Leunig's discussion of social savings provides a salutary reminder of the importance that the pioneer cliometricians gave to precise specification and to theory. The contributions in this volume also show how cliometrics has matured and evolved over the past half century. The range and the style of theories utilized are now broader. In some areas, for example, as Hatton shows in surveying the cliometrics of migration, coherent economic models became more firmly embedded in the historiography. The growing eclecticism of cliometrics in its use of economics is well illustrated by Fishback *et al.* (2010) in their analysis of the political economy of welfare in the USA.

In an important respect the Cliometric Society definition highlighting the use of economic theory and statistical techniques to study economic history does not fully capture the style of cliometrics discussed by Inwood and Roberts and by Prados. The construction of economic-historical data had a lead role in the growth of cliometrics, Often data construction has been informed by theory, most obviously in the estimation of GDP and real wages adjusted for purchasing power parity. Anthropometrics, though, and the measure of stature and body mass of past populations illustrates how the boundaries of cliometrics have expanded. That a grasp of price theory is no longer the defining skill of cliometricians appears

palpable when, for example, an understanding of the medical sciences underpins some modern measures of economic well-being. The discussion of the HDI by Prados shows how crucial theoretical concepts remain to quantitative indicators of well-being. His IHDI utilized an achievement function proposed by Kakwani (1993), and its adoption would have important policy implications because the IHDI shows levels of well-being for developing countries well below those reported by the United Nations.

The pioneer cliometricians were tardy in their use of econometrics. Statistical methods are now central to cliometric research, and a diversity of approach has accompanied the growth. In part the fuller use of econometrics was stimulated by the growth of computers and most especially of software that facilitated estimation. As Greasley and Oxley show the development of new methods of analysis has been especially strong in relations to time series data. Economic historians have long had interests in measuring trends, cycles and the relationships among time series data. The new methods of cointegration and causality analysis have already delivered new interpretations, for example, of the causes of the Industrial Revolution, and promise much more. The statistical toolkit of cliometricians though now spans widely and includes panel data techniques and computable general equilibrium models, and much like for theory, no single approach now dominates.

Cliometrics put economics back into to economic history. There are now hopeful signs that cliometricians are helping to put economic history back into economics. Nowhere is this more apparent than in the once dormant but now vibrant field of economic growth. Theoretical models of growth now incorporate human capital, geography and institutions, and the empirical analogues sometimes are based on long spans of historical data. Cliometricians will always be interested in understanding the past for its own sake, but economic history also offers experimental data that are presently utilized only to a limited extent by economists. Maddison (2008) in a perceptive response to the stern review on climate change highlighted how its predictions of the future ignored the past. An optimistic view of the next 50 years would obviate the need for similar observations at cliometrics centenary celebrations.

References

Acemoglu, D., Johnson, S. and Robinson, R. (2002) Reversal of fortunes: geography and institutions n the making of the modern world. *Quarterly Journal of Economics* 107: 1231–1294.

Aghion, P. and Howitt, P. (1992) A model of economic growth through creative destruction. *Econometrica* 60: 323–351.

Allen, R.C. (2001) The great divergence in European wages and prices from the Middle Ages to the First World War. *Explorations in Economic History* 38: 411–447.

Allen, R.C., Ma, D., Bassino, J., and van Zanden, J.L. (2010) Wages, prices, and living standards in China, 1738–1925: in comparison with Europe, Japan, and India. *Economic History Review* 64: S1, 8–38.

Anderson, M. (1971) *Family Structure in Nineteenth Century Lancashire*. London: Cambridge University Press.

Atack, J. and Passell, P. (1994) *A New Economic View of American History*. New York: Norton.
Aydelotte, W.O. (1963) Voting patterns in the British House of Commons in the 1840s. *Comparative Studies in Society and History* 5: 134–163.
Baldwin, R.E. (1999) Agglomeration and endogenous capital. *European Economic Review* 43: 253–280.
Barro, R.J. and Martin, X. Sala I. (1995) *Economic Growth*. New York: McGraw Hill.
Baten, J. and van Zanden, J.L. (2008) Book production and the onset of modern economic growth. *Journal of Economic Growth* 13: 217–235.
Benjamin, D. and Kochin, L. (1979) Searching for an explanation for unemployment in interwar Britain. *Journal of Political Economy* 87: 441–478.
Bernard, A. and Durlauf, S. (1995) Convergence in international output. *Journal of Applied Econometrics* 10: 97–108.
Bértola, L. and Porcile, G. (2006) Convergence, trade and industrial policy: Argentina, Brazil and Uruguay in the international economy, 1900–1980. *Revista de Historia Económica* 37–67.
Beveridge, L. (1939) *Prices and Wages in England from the Twelfth to the Nineteenth Century*. London: Frank Cass & Co.
Blalock, H.M. (1960) *Social Statistics*. Tokyo: McGraw Hill.
Bowley, A.L. (1900) *Wages in the UK in the Nineteenth Century*. Cambridge: Cambridge University Press.
Brown, E.C. (1956) Fiscal policy in the thirties; a reappraisal. *American Economic Review* 46: 857–879.
Burns, A.F. (1934) *Production Trends in the United States since 1870*. New York: NBER.
Cairncross, A.K. (1953) *Home and Foreign Investment 1870–1913*. Cambridge: Cambridge University Press.
Clark, G. (2005) The condition of the working class in England. *Journal of Political Economy* 113: 1307–1340.
Conrad, A. and Mayer, J. (1958) The economics of slavery in the Antebellum South. *Journal of Political Economy* 66: 95–130.
Costa, D. (1993) Height, weight, wartime stress, and older age mortality: evidence from the Union Army records. *Explorations in Economic History* 30: 424–449.
Crafts, N.F.R. and Harley, C.K. (1992) Output growth and the British revolution: a restatement of the Crafts-Harley view. *Economic History Review* 45: 703–730.
Crafts, N.F.R. and Venables, A.J. (2001) Globalization in history: a geographical perspective. CEPR discussion paper 3079.
Crafts, N.F R., Leybourne, S.J. and Mills, T.C. (1989) The climacteric in Late-Victorian Britain and France: a reappraisal of the evidence. *Journal of Applied Econometrics* 4: 103–117.
Crafts, N.F.R., Dimsdale, N. and Engerman, S. (1991) *Quantitative Economic History*. Oxford: Clarendon Press.
Cullen, M.J. (1975) *The Victorian Statistical Movement*. Hassocks: Harvester Press New York.
Deane, P. and Cole, W.A. (1966) *British Economic Growth, 1688–1959*. Cambridge: Cambridge University Press.
Dowrick, S., Dunlop, Y. and Quiggin, J. (2003), Social indicators and comparisons of living standards. *Journal of Development Economics* 70: 501–529.
Enflo, K., Kander, A. and Schon, L. (2008) Identifying development blocks – a new methodology implemented on Swedish industry. *Journal of Evolutionary Economics* 18: 57–76.
Engerman, S.L. (1976) The height of slaves in the United States. *Local Population Studies* 16: 45–49.

Engle, R.F. and Granger, C.W. (1987) Cointegration and error correction: representation, estimation, testing. *Econometrica* 55: 1057–1072.
Feinstein, C.H. (1972) *National Income Output and Expenditure of the UK 1855–1965*. Cambridge: Cambridge University Press.
Ferenczi, I. and Wilcox, W.F. (1929) *International Migrations*. New York: NBER.
Fishback, P., Allen, S., Fox, J. and Livingston, B. (2010) A patchwork safety net: a survey of cliometric studies of income maintenance programs in the United States in the first half of the twentieth century. *Journal of Economic Surveys* 24: 895–940.
Floud, R.C. (1973) *An Introduction to Quantitative Methods for Historians*. London: Methuen.
Floud, R.C. (1974) *Essays in Quantitative Economic History*. Oxford: Clarendon Press.
Floud, R. and Wachter, K.W. (1982) Poverty and physical stature. *Social Science History* 6: 422–452.
Fogel, R.W. (1964) *Railroads and Economic Growth: Essays in Econometric History*. Baltimore: John Hopkins.
Fogel, R.W. (1966) The new economic history: its findings and methods. *Economic History Review* 19: 642–656.
Fogel, R.W. (1979) Notes on the social savings controversy. *Journal of Economic History* 39: 1–54.
Fogel, R.W. and Engerman, S.L. (1969) A model for the explanation of industrial expansion during the nineteenth century. *Journal of Political Economy* 77: 306–328.
Fogel, R.W. and Engerman, S.L. (1974) Time on the cross. *The Economics of American Negro Slavery*. Boston.
Ford, A. (1971) British investment in Argentina and Long Swings, 1880–1914. *Journal of Economic History* 31: 650–663.
Friedman, M. and Schwartz, A.J. (1963) *A Monetary History of the United States*. Princeton: Princeton University Press.
Gallaway, L. and Vedder, R.K. (1971) Emigration from the United Kingdom to the United States. *Journal of Economic History* 31: 885–897.
Galor, O. and Weil, D. (2000) Population, technology and growth: from Malthusian stagnation to demographic transition and beyond. *American Economic Review* 90: 806–828.
Goldin, C. (2001) The human capital century and American Leadership: virtues of the past. *Journal of Economic History* 61: 263–292.
Granger, C.W.J. and Newbold, P. (1974) Spurious regressions in econometrics. *Journal of Econometrics* 2: 111–120.
Greasley, D. (1982) The diffusion of machine-cutting in the British coal industry 1902–38. *Explorations in Economic History* 19: 246–268.
Greasley, D. and Madsen, J.B. (2010) Curse and boon: natural resources and long run growth in currently rich economies. *Economic Record* 86: 311–328.
Greasley, D. and Oxley, L. (1994) Rehabilitation sustained: the industrial revolution as a macroeconomic epoch. *Economic History Review* 47: 760–768.
Greasley, D. and Oxley, L. (1996) Discontinuities in competitiveness: the impact of the first world war on British industry. *Economic History Review* XLIX: 83–101.
Greasley, D. and Oxley, L. (1997) Time series based tests of the convergence hypothesis: some positive results. *Economics Letters* 56: 143–147.
Greasley, D. and Oxley, L. (1998) Causality and the first industrial revolution. *Industrial and Corporate Change* 7: 33–47.
Greasley, D. and Oxley, L. (2000) British industrialization 1815–1860: a disaggregate time series perspective. *Explorations in Economic History* 37: 98–119.
Greasley, D., and Oxley, L. (2004) Globalization and real wages in New Zealand 1873–1913. *Explorations in Economic History* 41: 26–47.

Greasley, D. and Oxley, L. (2010a) Knowledge, natural resource abundance and economic development: lessons from New Zealand 1861–1939. *Explorations in Economic History* 47: 443–459.
Greasley, D. and Oxley, L. (2010b) Cliometrics and time series econometrics: some theory and applications. *Journal of Economic Surveys* 24: 755–774.
Greasley, D., Madsen, J.B. and Oxley, L. (2001) Income uncertainty and consumer spending during the Great Depression. *Explorations in Economic History* 38: 225–251.
Hansen, G. and Prescott, E.C. (2002) Malthus to Solow. *American Economic Review* 92: 1205–1217.
Harvey, A.C. (1989) *Forecasting Structural Time Series Models and the Kalman Filter*. Cambridge: Cambridge University Press.
Hatton, T.J. (1995) A Model of U.K. Emigration, 1870–1913. *Review of Economics and Statistics* 77: 407–415.
Hatton, T.J. (2010) The cliometrics of international migration: a survey. *Journal of Economic Surveys* 25: 941–969.
Hatton and Williamson (1998) *Global Migration and the World Economy*. Cambridge, MA: The MIT Press.
Hicks, U.K. (1938) *The Finance of British Government 1920–1936*. Oxford: Clarendon.
Hoffman, W.G. (1955) *British Industry 1700–1950*. Oxford: Blackwell.
Hudson, P. (2000) *History by Numbers*. London: Arnold.
Huff, W.G. (2002) Boom or bust commodities and industrialization in pre-world war in Malaya. *Journal of Economic History* 62: 1074–1115.
Hughes, J.R.T. and Reiter, S. (1958) The first 1945 British steamships. *Journal of the American Statistical Association* 53: 360–381.
Inwood, K. and Roberts, E. (2010) Longitudinal studies of human growth and health: a review of recent historical research. *Journal of Economic Surveys* 24: 801–840.
Jenks, L.H. (1927) *The Migration of British Capital to 1875*. New York: A.A. Knopf.
Jerome, H. (1926) *Migration and Business Cycles*. New York: NBER.
Kakwani, N. (1993) Performance in living standards. An international comparison. *Journal of Development Economics* 41: 307–336.
Keay, I. (2007) The engine or the caboose: resource industries and twentieth century Canadian economic performance. *Journal of Economic History* 67: 1–32.
Krugman, P. and Venables, A.J. (1995) Globalization and the inequality of nations. *Quarterly Journal of Economics* 110: 857–880.
Kuznets, S. (1930) *Secular Trends in Prices and Production*. New York: NBER.
Lee, C.H. (1977) *The Quantitative Approach to Economic History*. London: Martin Robertson.
Leunig, T. (2010) Social Savings. *Journal of Economic Surveys* 24: 775–800.
Lewis, W.A. (1949) *Economic Survey, 1919–1939*. London: Unwin.
Leybourne, S., Kim, T.-H., and Taylor, A.M.R. (2007) Detecting multiple changes in persistence. *Studies in Nonlinear Dynamics & Econometrics* 11: 1–32.
Lucas, R.E. (2001) Externalities and cities. *Review of Economic Dynamics* 4: 245–274.
Maddison, A. (2001) *The World Economy: a millennial perspective*. Paris: OECD.
Maddison, A. (2004) Quantifying and interpreting world development: macro measurement before and after Colin Clark. *Australian Economic History Review* 44: 1–34.
Maddison, A. (2008) The west and the rest in the world economy. *World Economics* 9: 75–100.
Matthews, R.C.O. (1954) *A Study in Trade Cycle History*. Cambridge: Cambridge University Press.
Matthews, R.C.O., Feinstein, C.H. and Odling-Smee, J.C. (1982) *British Economic Growth 1856–1973*. Oxford.
McCloskey, D.N. (1970) Did Victorian Britain fail? *Economic History Review* 23: 446–459.

McCloskey, D.N. (1971) *Essays on a mature economy: Britain after 1840*. London: Methuen.
McCloskey, D.N. (1978) The achievements of the cliometric school. *Journal of Economic History* 38: 13–28.
McCloskey, D.N. (1987) *Econometric History*. London: Macmillan.
Mitchener, K.J. and James, K. (2005) Bank supervision, regulation, and instability during the Great Depression. *Journal of Economic History* 65: 152–185.
Morgan, M.S. (1990) *The History of Econometric Ideas*. Cambridge: Cambridge University Press.
Nef, J.U. (1932) *The Rise of the British Coal Industry*. London: Routledge.
North, D.C. (1990) *Institutions, Institutional Change and Economic Performance*. Cambridge: Cambridge University Press.
O'Grada, C. (1993), The Irish paper pound of 1797–1820: some cliometrics of the Bullionist debate. *Oxford Economic Papers* 45: 148–156.
O'Rourke, K.H. (2007) Culture, conflict and cooperation: Irish dairying before the Great War. *Economic Journal* 117: 1357–1379.
O'Rourke, K.H. and Williamson, J.G. (1999) *Globalization and History: The Evolution of the Nineteenth Century Atlantic Economy*. Cambridge, MA: MIT Press.
Parente, S.L. and Prescott, E.C. (2000) *Barriers to Riches*. Cambridge, MA: MIT Press.
Perron, P. (1989) The Great crash, the oil price shock, and the unit root hypothesis. *Econometrica* 57(6): 1361–1401.
Phelps Brown, E.H. and Hopkins, S.V. (1955) Seven centuries of building wages. *Economica* 22: 195–206.
Phillips, W.A. (1958) Relationship between employment and the rate of change of money wage rates in the United Kingdom. *Economica* 25: 283–299.
Phillips, P.C.B. and Yu, J. (2009) Singapore Management University Economics and Statistics Working Paper Series, No. 18-2009: 1–38.
Pope, D. (1968) Empire migration to Canada, Australia, and New Zealand. *Australian Economic Papers* 7: 167–188.
Prados, L. (2010) Improving human development: a long-run view. *Journal of Economic Surveys* 24: 841–894.
Reading, D. (1973) New deal activity and the states, 1933–39. *Journal of Economic History* 33: 792–810.
Rebelo, S. (1991) Long run policy analysis and long run growth. *Journal of Political Economy* 99: 500–521.
Rogers, J.E.T. (1866–1902) *A History of Agriculture and Prices in England*. Oxford: Clarendon.
Romer, P. (1986) Increasing returns and long-run growth. *Journal of Political Economy* 94: 1002–1037.
Rostow, W.W. (1948) *British Economy in the Nineteenth Century*. Oxford: Clarendon.
Sachs, J.D. and Warner, A.M. (2001) The curse of natural resources. *European Economic Review* 45: 827–838.
Samuelson, P.A. and Solow, R.M. (1960) Analytical aspects of anti-inflation policy. *American Economic Review* 50: 177–194.
Saul, S.B. (1954) Britain and world trade, 1870–1914. *Economic History Review* 7: 49–66.
Sayers, R.S. (1936) *Bank of England Operations 1890–1914*. London: P.S. King and Son.
Schlote, W. (1932) *British Overseas Trade from 1700–1930s*. Oxford: Blackwell.
Sokoloff, K.L. and Engerman, S.L. (2000) History lessons: institutions, factors endowments, and paths of development in the New World. *Journal of Economic Perspectives* 14: 217–232.
Steckel, R.H. (2008) Biological measures of the standard of living. *Journal of Economic Perspectives* 22: 129–152.

Taylor, A.J. (1975) *The Standard of Living in Britain in the Industrial Revolution*. London: Methuen.
Temin, P. (1973) *New Economic History*. London: Penguin.
Thomas, B.R. (1954) *Migration and Economic Growth: A Study of Great Britain and the Atlantic Economy*. Cambridge: Cambridge University Press.
Tinbergen, J. (1939) *Statistical Testing of Business-Cycle Theories*. Geneva: League of Nations.
Waaler H. (1984) Height, weight and mortality. The Norwegian experience. *Acta Medica Scandinavica* Supplement 679: 1–56.
Wadsworth, A.P. and Mann, J. de L. (1931) *The Cotton Trade and Industrial Lancashire, 1600–1780*. Manchester: Manchester University Press.
Williamson, J.G. (1995) The evolution of global labor markets since 1830: background evidence and hypotheses. *Explorations in Economic History* 32: 141–196.
Williamson, J. (2002) Land, labor, and globalization in the third world, 1870-1940. *Journal of Economic History* 62: 55–85.
Wood, G.H. (1910) *The History of Wages in the Cotton Trade during the past 100 years*. Manchester: Sherratt and Hughes.
Wright, G. (1971) Econometric studies of history, in M. D. Intrilligator. *Frontiers of Quantitative Economics*. Amsterdam: North Holland.
Wright, G. and Czelusta, J. (2003) Mineral resources and economic development. Paper presented at the conference on sector reform in Latin America. Stanford Center for Economic Development.
Wrigley, E.A. (1966) Family limitation in pre-industrial England. *Economic History Review* 19: 82–109.
www.eh.net *Measuring Worth* (last accessed 19th September 2010).
Zanden van, J.L. (1999) Wages and the standard of living in Europe. *European Review of Economic History* 2: 175–197.

2

SOCIAL SAVINGS

Tim Leunig

1. Introduction

The cliometrics revolution that began in the 1960s is usually thought of as the application of formal economic modelling and econometrics to questions which had long interested economic historians, and which had previously been approached using primarily literary and archival techniques familiar to conventional historians. Although there is a considerable degree of truth in this understanding, it is incomplete, because the cliometric revolution also involved the development of new concepts, including 'social savings'.

This review of social savings will consist of six substantive sections. In Section 2, we will define social savings and compare it with other methods of assessing technological change, namely consumer surplus, total factor productivity and growth accounting. This will provide a theoretical underpinning and will be useful as a stand-alone section for those who are interested in the concept, but who have little interest in the particular ways in which it has been used by other economic historians. Section 3 will look in some detail at the early work of Robert Fogel, whose work on railroads represents the pioneering application of the concept of social savings to technological change in economic history. This section will not aim to adjudicate on the various criticisms made of his specific estimates, but rather to use the debates to explore the issues that are critical in actually constructing an estimate of social savings for an historical event. Section 4 will list and contrast the various other railway social savings estimates that have been compiled. Again, the aim is not to say whether railways were of more use in one country than in another, but rather to show the strengths and weaknesses of the social savings methodology, both in general and in the particular ways in which economic historians have actually applied them. Section 5 will go on to outline some applications of the social savings methodology to non-railway issues, and to explore other areas to which the approach could be used, perhaps profitably. Some very basic new social savings estimates will be presented, and these will again be used to explore the strengths and weaknesses of the concept. Section 6 will conclude, by summarizing what we have learned, and setting out some ways in which social savings estimates could

Economics and History, First Edition. David Greasley and Les Oxley

be improved in future, and setting out some areas to which social savings estimates could be applied by other researchers, whether economic historians interested in the past, or economists interested in present day issues.

2. The Definition of Social Savings, and a Comparison with Other Measures

The concept of social savings is defined as how much extra society would have to pay to do what it did after an innovation, without it. Algebraically, therefore, we can write that

$$Social\ savings = (c_{t-1} - c_t)Q_t \tag{1}$$

where c represents marginal cost and Q total quantity, and where t means post-innovation and $t-1$ pre-innovation.

Assuming that the market is perfectly competitive, we can take prices as the measure of cost. In this situation, we can write that

$$Social\ savings = (P_{t-1} - P_t)Q_t \tag{2}$$

where P represents price, and all other notation remains the same. Since data on costs as opposed to prices are usually very hard to come by, economic historians use this definition as a matter of routine, and as such *de facto* assume that markets are competitive, and thus that price is equal to cost.

Social savings are usually expressed as a percentage of national income, and can be thought of as equivalent to national income. Thus, if a million people get something for US$8 instead of US$10 as a result of an innovation, the social saving of that innovation is calculated as US$2 million, which can be taken to mean that society is US$2 million better off. Sometimes the benefits of an innovation are not monetized – for example time savings caused by faster transport. These time savings clearly have a value, but only those time savings that occur during hours for which people are paid form part of national income. Time savings for people who are commuting to work or engaged in leisure journeys are not captured in GDP but are clearly welfare enhancing. The value of this sort of time saving is captured as part of a social savings estimate. In this case a social saving estimate of a particular magnitude is still equivalent to a rise in national income of that magnitude, but does not imply that measured national income has risen by that magnitude. If railways save leisure travellers time that they value at US$1 billion, then they would be willing to pay US$1 billion for that time saving, and the railway has increased welfare by an amount equal to a rise in national income of US$1 billion, whether or not passengers have to pay the US$1 billion or whether it takes the form of greater consumer surplus, not captured by either the railway company or the national income statisticians.

2.1 *A comparison of Social Saving and Other Measures in Economics*

The social savings methodology is a way to calculate the value of technological change, but it is self-evidently not the only one. It is therefore useful to investigate