

The Economics of John Rae

Edited by

O.F. Hamouda, C. Lee and D. Mair

Routledge Studies in the History of Economics



**Also available as a printed book
see title verso for ISBN details**

THE ECONOMICS OF JOHN RAE

John Rae wrote on a number of scientific subjects, but it is for his contribution to economics that he is best remembered. Although Rae was held in high esteem by some of the great names from the past who have openly acknowledged his originality and their indebtedness to him, he has not yet received all the attention he deserves. This collection of essays by respected economists redresses the general neglect of Rae as a classical economist, and examines his role as a political economist.

The contributions to the volume are presented in four sections:

- John Rae's life and works.
- Issues of methodology and history.
- Capital and related issues.
- Rae's contributions to the development of economic ideas in the history of economic thought.

They assess Rae's main contributions to economics in the areas of economic methodology, history of technology, conspicuous consumption, the theory of capital and technical change, the demand for and supply of capital, saving and interest in the theory of accumulation, monetary theory, international trade and public policy.

The Economics of John Rae is a much-needed evaluation of the work of an important economist, and will stimulate further study by historians of economic thought and methodology.

O.F.Hamouda is Professor of Economics at York University, Toronto, Ontario. **C.Lee** is Professor of Economics at the University of Aberdeen. **D.Mair** is Professor of Economics at Heriot-Watt University, Edinburgh.

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London and New York

First published 1998
by Routledge
11 New Fetter Lane, London EC4P 4EE

This edition published in the Taylor & Francis e-Library, 2005.

“To purchase your own copy of this or any of Taylor & Francis or Routledge’s collection of thousands of eBooks please go to www.eBookstore.tandf.co.uk.”

Simultaneously published in the USA and Canada
by Routledge
29 West 35th Street, New York, NY 10001

Editorial matter and selection © 1998 O.F.Hamouda, C.Lee and D.Mair
Individual contributions © 1998 contributors

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British Library Cataloguing in Publication Data
A catalogue record for this book is available from the British Library

Library of Congress Cataloguing in Publication Data
A catalogue record for this book has been requested

ISBN 0-203-97659-2 Master e-book ISBN

ISBN 0-415-15867-2 (Print Edition)

DEDICATED TO R.W.JAMES

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CONTRIBUTORS

Syed Ahmad is Emeritus Professor of Economics at McMaster University, Hamilton, Ontario. His many publications include: *Capital in Economic Theory* (1991); “John Rae (1834), Schumpeter (1911) and Amsden (1989) on Technical Change and Economic Development” (1993); “Smith’s Division of Labour and Rae’s ‘Invention’” (1996); and “On John Rae’s Controversial Contributions to Economics” (1996).

Anthony Brewer is Professor of Economics at the University of Bristol in the United Kingdom. His many publications include the papers “John Rae’s Theory of Capital and Economic Growth” (1990), and “Economic Growth and Technical Change: John Rae’s Critique of Adam Smith” (1991).

Robert W. Dimand is Professor of Economics at Brock University, St. Catharines, Ontario. His many publications include: *The Origins of the Keynesian Revolution* (1988), “Political Protest and Political Arithmetic on the Niagara Frontier: Robert Gourlay’s *Statistical Account of Upper Canada*” (1992), and “Ricardo and International Trade Theory” (1995).

Alexander Dow is Professor of Economics at Glasgow Caledonian University. With Sheila Dow, Alan Hutton, and Michael Keaney, he is a member of a working group dedicated to tracing the roots and legacy of a Scottish political economy tradition. The group has co-authored “Traditions in Economics: The Case of Scottish Political Economy” (1995).

Sheila Dow is Professor of Economics at the University of Stirling, Scotland. In addition to a large body of independent work, she is, together with Alexander Dow, Alan Hutton, and Michael Keaney, a member of the working group dedicated to tracing the roots and legacy of a Scottish political economy tradition.

S.A. Drakopoulos is associated to the department of Economics at the University of Aberdeen, Scotland, and to the Department of Philosophy and History of Science at the University of Athens, Greece. He is the author of *Values and Economic History* (1991).

Michael J.Gootzeit is Professor of Economics at the University of Memphis, Tennessee. His many publications include the paper “The Evolution of the Savings Concept” (1995), which is relevant to his contribution in this volume.

O.F.Hamouda is Professor of Economics at York University, Toronto, Ontario. He has published a number of works, and is co-author of *Verification in Economics and History* (Routledge, 1991), a study on the methodology of economics.

Samuel Hollander is Emeritus Professor of Economics at the University of Toronto, Ontario. His many publications include, *The Economics of Adam Smith* (1973), *The Economics of David Ricardo* (1979), and *Classical Economics* (1987).

Alan Hutton is Lecturer in Economics at Glasgow Caledonian University, and, together with Alexander Dow, Sheila Dow, and Michael Keaney, a member of the working group dedicated to tracing the roots and legacy of a Scottish political economy tradition.

R.Warren James, who now lives in Ontario, is the distinguished biographer of John Rae, and was also responsible for the reissue in 1965 of Rae’s *Statement of Some New Principles* and other works.

Michael Keaney is associated to the Department of Economics at Glasgow University, and, together with Alexander Dow, Sheila Dow, and Alan Hutton, is a member of the working group dedicated to tracing the roots and legacy of a Scottish political economy tradition.

Anthony J.Laramie is Professor of Economics at Merrimack College, Massachusetts. With Douglas Mair, he has co-authored several papers on a post-Keynesian Kaleckian theory of taxation and tax model, which they link with their study of John Rae in this volume.

Clive Lee is Professor of Economics at the University of Aberdeen. As a prominent local historian of Scotland, he has done much to promote John Rae as a “native son” of Aberdeen and to emphasize his place in the history of Marischal College and the University of Aberdeen.

Douglas Mair is Professor of Economics at Heriot-Watt University, Edinburgh. His keen desire to reawaken interest in John Rae is, in large part, the inspiration for this present volume. Among his published works is the paper “John Rae: Ugly Duckling or Black Swan?” (1990), and he was the editor of the volume, *The Scottish Contribution to Modern Economic Thought* (1990).

Andrea Maneschi is Professor of Economics at Vanderbilt University, Nashville, Tennessee. His many publications include the papers “John Rae on Capital Theory, Inventions, Trade and Infant Industries” (1995), and “John Rae on Trade, Inventions, and Infant Industries: A Capital-Theoretic Perspective” (1998).

Roger Mason is Professor of Consumer Theory at the University of Salford in the United Kingdom. Among his many publications is *Conspicuous Consumption: A Study of Exceptional Consumer Behaviour* (1981).

B.B.Price is Visiting Professor at the Massachusetts Institute of Technology, Cambridge, Massachusetts, and Professor of History at York University, Toronto, Ontario. She has published several articles on the history of technology, and is co-author of *Verification in Economics and History* (Routledge, 1991).

Thomas K.Rymes is Professor of Economics at Carleton University, Ottawa, Ontario. His many publications include the paper “Technical Process, Research and Development” (1989), which is relevant to his contribution in this volume.

Masazumi Wakatabe is associated to the Department of Economics at the University of Toronto, Ontario, and to the Department of Economics at Waseda University, Japan. He is currently pursuing doctoral work dedicated to the study of the economics of John Rae.

ACKNOWLEDGMENTS

The essays in this volume are the outcome of a conference that was part of the quinentenary celebration of the University of Aberdeen. The conference was held at the university on 27–29 March 1996 to mark the bicentenary of Rae's birth in Aberdeen on 1 June 1796 and to honour Rae as one of its distinguished alumni. Although the Aberdeen conference was an occasion for the group of international scholars gathered at King's College to celebrate Rae, it was also an opportunity to record appreciation of the work of R. Warren James (1965), Rae's biographer. Without James's devoted service to Rae's life and writings in Scotland and North America, Rae would not enjoy even his current rather limited recognition. Whatever the reason for the comparative neglect of Rae, James is wholly exonerated.

Rae has not yet received all the attention he deserves and a need was felt, from both the Scottish and the North American sides, to redress the general neglect of Rae as a classical economist and to assess his role as a political economist. The aim in the present essays is thus to look afresh at Rae by assessing and discussing his main contributions to economics in the areas of economic methodology, history of technology, conspicuous consumption, the theory of capital and technical change, the demand for and supply of capital, saving and interest in the theory of accumulation, monetary theory, international trade, and public policy.

The editors acknowledge with gratitude financial assistance from the Scottish Economic Society towards the cost of the Rae conference. The Lord Provost and Council of the City of Aberdeen are thanked for their generous hospitality to all the conference participants in hosting a reception at the Town House. The editors also thank Alan Jarvis for his support, and his staff at Routledge and Grace Kim at MIT for editorial and production skills in bringing this collection of essays to publication.

INTRODUCTION

To the extent Rae is known, it has been primarily for his *Statement of Some New Principles on the Subject of Political Economy Exposing the Fallacies of Free Trade and Some Other Doctrines Maintained in the "Wealth of Nations"* (1834) which contains, as well as an early strong critique of Smith's *Wealth of Nations*, the first systematic articulation of the infant industry argument for protection and a pioneering capital theory. Robbins (1968) in his *Theory of Economic Development* portrays Rae's "series of chapters on the theories of capital and invention [as] quite unique in the literature of their time, both for their originality and their insight". He describes Rae on the effects of invention and the growth of knowledge as "probably the most profound of all who have treated this subject" and on the articulation of the infant industry argument, "if we are looking for pure excellence of intellectual analysis, the palm must clearly go to John Rae" (Robbins 1968:51, 89, 113).

John Rae was indeed a classic scholar, whose outstanding ideas earned him the praise of J.S.Mill, I.Fisher, E.Böhm-Bawerk and others. Rae's elaboration of a theory of capital was the precursor of much later theories, of Böhm-Bawerk and Fisher. Having heard about Rae's *New Principles* from Nassau Senior, John Stuart Mill read it and quoted from it at some length in his own *Principles of Political Economy* (1848). Mill compared Rae's analysis of the forces leading to the accumulation of capital with Malthus's work on population. Inspired further by Rae's carefully crafted justification of protection for infant industries and his effective rebuttal of Smith's critique of the argument, Mill also became convinced of its validity, and, through Mill's advocacy, Rae's argument entered the mainstream of economics.

Despite Mill's recognition, Rae's work was practically ignored by other classical economists and by the new generation of marginalists such as Jevons. Even the best-known pioneer of capital theory, Böhm-Bawerk, was aware of Rae only because of Mill's comments on his work, but those comments had not revealed to him that Rae's work centred on the theory of capital. When C.W.Mixter (1897:190) pointed out that Rae "anticipated Böhm-Bawerk's theory of interest, in the substance of its leading features and in many of its details and even to a greater extent in the exact form of its

expression,” Böhm-Bawerk ([1884] 1900) very properly and magnanimously acknowledged his “belated recognition of Rae’s highly original ideas”. Irving Fisher was another latter-day admirer of Rae and dedicated his *Theory of Interest* (1930) “To the Memory of John Rae and of Eugen Von Böhm-Bawerk Who Laid the Foundations Upon Which I Have Endeavoured To Build,” recognizing that “every essential part of [my own theory] was at least foreshadowed by John Rae in 1834.”

Rae’s influence on Schumpeter’s early work is evident from *Theory of Economic Development* ([1911] 1934). The mature Schumpeter had lost none of his admiration for Rae, writing in *History of Economic Analysis* (1954: 468–9) “in vision and originality, Rae far surpassed the economists who were successful... For it is this that we must see in his work: another *Wealth of Nations* or, more correctly, something that with ten additional years of quiet work, graced by an adequate income, could have grown into another—and more profound—*Wealth of Nations*.” The second book of Rae’s *New Principles*, Schumpeter asserted, “may be called a theory of capital, conceived in unprecedented depth and breadth.”

Lest it be thought that Rae’s intellectual heritage is neoclassical or exclusively “Austrian,” Mitchell (1934) regarded Rae as “the founding father of American institutionalism” due to his treatment of luxury expenditures and status-seeking ostentatious display. Rae made a significant contribution in this field which was to be overshadowed by Veblen’s later explorations of pecuniary emulation and the formation of tastes. Veblen appears to have been rather noticeably sensitive to questions about his indebtedness to Rae.

It seems that Rae was held in high esteem by some of the great names from the past who have openly acknowledged his originality and their indebtedness to him. Yet his writings today are appreciated by only a coterie of cognoscenti. Despite James’s best efforts at breathing life into Rae with his biography, and in editing and bringing to publication virtually all of his extant works, Rae’s contribution has still failed to achieve the distinguished recognition which his contemporary readers felt it merits. Even in Scotland, Rae has been dismissed by Gray and Thompson (1980) as having at best offered some useful correctives to Smith’s *Wealth of Nations* and having provided some ideas which were later picked up by Carey and Veblen. Macfie’s (1955) much more sympathetic treatment of Rae surprisingly relegates him to the second division of Scottish political economists. Rae has not yet received all the attention he deserves.

Warren James has already done enormous research work on Rae’s biography. Readers curious to learn more of the education and career of the fascinating man should turn to James (1951, 1965). Here we provide merely a brief sketch of Rae. At nineteen, he graduated with an MA from Marischal College in Aberdeen in 1815. As a student he displayed “remarkable inventive attitudes” and designed several ingenious pieces of scientific and engineering apparatus. From Aberdeen he went to Edinburgh

University as a medical student and in his MD dissertation came to the conclusion that the physiological theories of his day were fundamentally false. After Edinburgh, Rae studied in Paris.

Family circumstances in Aberdeen forced Rae to emigrate with his wife from Scotland to Montreal in 1822. He shortly moved to Williamston and then later to Hamilton, in present-day Ontario, where he took up the post of village schoolmaster. He combined teaching with the practice of medicine and started to write articles on economic development for early Canadian learned journals. Rae was closely involved with the large Scottish community in Canada and was particularly associated with the Presbyterian Church of Scotland in its struggle with the Church of England to establish Scottish Presbyterian principles in education and religious practice. By the early 1830s, Rae had emerged as a leading spokesman for the Kirk and had also established a reputation as a serious thinker on the problems of economic development.

In Canada, Rae worked variously in the timber trade, as a schoolmaster and as a doctor. Later travels took him to Boston and New York as a teacher, to Central America as a doctor, to California in the 1848 Gold Rush as a teacher, to the Kingdom of Hawaii as a teacher, local judge, and medical officer, and finally back to the USA, where he died on Staten Island in 1872.

While in Canada, Rae became involved politically and aligned himself with a predominantly Scottish Presbyterian merchant faction, partly because he believed that the Presbyterian ethic had an important role to play in the development of a capital-hungry economy and partly because commercial links with Britain were of paramount importance to Canadian trade. Rae was already engaged in an extensive economic and statistical survey of Canada in the 1830s when he wrote his *New Principles*. This work was a by-product of his study of Canada and was conceived by Rae to provide a rationale for Canada's loyalty to the Crown and the Mother Country and its continuing colonial status. In 1834, Rae went to Boston to organize publication of his *New Principles*. There was in Boston at the time a vigorous protectionist lobby which was looking for an intellectual argument for protectionism as a counter to the laissez-faire liberalism of the *Wealth of Nations* which was very influential in North America. In the 1820s and 1830s, Lower Canada with its factions of French Canadians and Scottish merchants was caught up in this struggle of ideas abroad at the time in Europe and the USA. When Rae arrived from the antagonistic backwoods of Canada clutching a manuscript entitled *Statement of Some New Principles on the Subject of Political Economy Exposing the Fallacies of Free Trade and Some Other Doctrines Maintained in the "Wealth of Nations,"* he was welcomed by the protectionists with open arms.

All this can be learnt from James (1965a, vol. 1). Included in James's contribution to this collection, "Birthday Greetings to John Rae," are, however, some fascinating and hitherto unknown insights into Rae's

character and personality. It seems that as a schoolmaster, Rae was held in much affection by his pupils. “He had a very loving disposition which endeared him to us all...he taught me rabbit, mink and muskrat trapping and other sports attractive to youth” (see p. 25). “In appearance he was tall, rather slender, and dignified” and was one of the most accomplished skaters in Hamilton whose “pupils labored diligently to master the long graceful stroke of the teacher” (Smith 1905:14).

After being forced by religious politics to give up his career as a school-teacher in Canada, Rae became in his own words “a wanderer and adventurer over the wide earth” (letter from Rae to H.B. Willson, December 27, 1849, quoted by James 1965a, 1:101). At one stage, his travels took him to Hawaii where he was appalled by the efforts of the American missionaries to impose strict standards of Christian morality on the easy going sexual behaviour of the islanders. In his capacity as medical officer in Hawaii he strove manfully to control the spread of smallpox and sexual diseases, although by James’s account, Rae’s remedies appear to have been extremely primitive. Rae moved in the highest circles in Hawaii; on one occasion he tended the injuries from a horse-riding accident of a member of the entourage of King Kamehameha IV.

In later life, Rae’s eyesight began to fail and in 1871 he accepted the invitation of his former student and benefactor, Sir Roderick Cameron, to live with him on his estate on Staten Island. Rae died there in 1872, and his gravesite on Staten Island is currently overgrown with weeds and bushes.

The economics of John Rae

Undoubtedly Rae’s approach to economics was influenced most prominently by his residence in Canada during the writing of his principal economic work, but there are three elements of that experience which seem to have had particular impact on the scope and content of his ideas:

- 1 the relative levels of economic development in Great Britain and Canada at the time of Rae’s emigration;
- 2 the perspective on viewing the economic differences which Rae’s Scottish education afforded him; and
- 3 the politically divisive context of Canadian life.

To each of these elements seem to be bound the stronger aspects of Rae’s economic ideas. To Rae’s highly educated perspective on the economic condition in general were connected his methodological approach to the exposition of economic ideas and counterideas and his sense of their place in a larger body of thought. To his awareness of the striking contrast in economic developments can be linked his economic theories per se on capital and its accumulation, money, technical change, production and

consumption, and trade. To his experience of the political divisiveness of Canada is owed, at least in part, Rae's conviction in the necessity for public policies, whether legislated economic or morally persuasive ones. The first four chapters in the volume address issues of methodology and history.

I

Rae emigrated to Canada at a prime age, already with a good, solid, versatile educational background obtained in both Aberdeen and Edinburgh. His knowledge of the classics and general philosophy led him to emphasize beginning any study, even political economics, by laying the foundation for its principles. He grounded his economics in particular in clearly distinguishing causes from effects and in devising an inductive method of inquiry into the sources of the wealth of a nation.

Much as the life of John Rae might be described as intriguing and dynamic, so too could his thought, especially as he exhibited such a clear general interest in methodologies. Hamouda in "On Rae's Methodology of Economics" argues that Rae believed in the possibility of knowing or at least of being exposed to knowledge and on the importance of the method of learning pursued. Rae felt that one kind of knowing could come easily to human beings—"popular," "explanatory," or "systematic" knowledge—but that only another, although more difficult to acquire, could, with its potential for more and surer conclusions, lead to truth and serve as judge—"inductive" or "scientific" knowledge. Rae highlighted two specific limitations to knowledge on the part of all human beings, our inability to forecast the future with precision and our partial perception, the latter fact being quite disturbing to him.

Rae took a very outspoken position on the appropriateness of one particular methodology, induction, esteeming it to be the most appropriate to acquiring and affirming knowledge, particularly as presented by the English philosopher Francis Bacon. Rae's advocacy of Bacon's method derived from six explicit reasons, among them its "paedagogical" applications, in its use of verifying tests, and ultimately, and most importantly, in its ability to select for erroneous common knowledge or other mistaken assertions. Rae uses his commitment to the inductive method of Bacon to two specific ends:

- 1 to show that induction is not the method used by Adam Smith in the construction of his arguments in the *Wealth of Nations*; and
- 2 to intimate that induction is the method by which one might refute the theses of Smith or at least be able to classify his affirmations as those of a special case.

Rae first established that "the object at which his [Smith's] philosophy aims" is the expression of "mere inventions of the imagination" or "an imaginary

machine.” None of his criticism of Smith’s method ought to come as a surprise, however, Rae argued, for Smith himself did not intend for his work to be taken as an inductive study.

As for the methodology Rae actually employed in his own study of political economy, his critics found him hardly a purist, but from the combination of his adoption with Smith of a “common standard” for the scope of political economy and his residence in Canada during the time of his writing his economic work, he did develop a form of induction, and perhaps more importantly, an integrated hierarchical classification of all areas of human knowledge dependent upon empirical investigation as its foundation.

Another methodological aspect discussed by Rae is identified by Drakopoulos as “The Concept of Orders of Instruments and Goods.” Given that with the marginalist revolution a significant shift in the classical framework has been observed, Drakopoulos sets out to illustrate, using Rae, and C.Menger, one of the first adherents of the marginalist school, how the word “order” conceptually changed in this shift. His examination focuses on Rae’s application of “order” to “instruments” and Menger’s, to “goods.”

Rae’s “instrument” is “any means for the attainment of some end,” with the most basic “end” being the fulfilling of human wants. Rae provides examples of instruments, a field, wheat, flour, tools, machines, etc., and lists their three points in common:

- 1 they are formed by human labour;
- 2 they “produce events” for supplying human wants; and
- 3 between their formation and exhaustion, some time elapses.

Drakopoulos sees in the first point the classical theory of value, since labour is the common measurement of instruments’ capacity.

Rae applies the concept of “order” to instruments. Despite few examples, Rae’s rules for the placement of instruments into “orders” define them as ranks according to relative efficiency (in terms of time, capacity, and cost) of instruments’ return. One might, according to Rae, posit an infinite number of orders, since both the length of time between an instrument’s formation and its exhaustion (its lifespan), and the amount of capacity and the cost of its formation determine its order. For practical purposes, however, if an instrument has produced goods double in value to its original cost by the time of its exhaustion, for example, at the end of one year, it is of relative Order A. If after two years, it is of Order B, and so on.

Drakopoulos parallels Rae’s establishing his theory of capital on time and cost of production with Menger’s establishing his consumer theory of value on subjective satisfaction. Menger defines his four “orders” as “ranks of proximity to the satisfaction of human needs” and uses satisfaction for comparing “goods.” His examples of goods are quite similar to Rae’s

instruments, but with first-order goods representing those which satisfy human needs directly (second-order goods, used for the production of the first-order goods, etc.), undeniably, the implication of the concept of “order” in Menger is radically different from that in Rae.

To complete the sophisticated methodological approach required for investigation of a theory of capital and technical change Rae studied extensively the history of technology. Technological change was an issue of extreme importance to John Rae. Price maintains in “Rae’s Theory of the History of Technological Change” that lying inexplicitly behind Rae’s route to a theory of technological change was his conviction in the value of history as a guide. In addition to providing the researcher with a rich data base, the historical perspective also contains both the dimension of time’s passage, which Rae found particularly important in his conjoined investigation of technology and capital investment, and its course of changes, which, since it often cannot be predicted, exposes the limitations to obtaining theoretical conclusions from history. Rae acknowledged such limitations through three historical examples: the wedge, the plough, and the steam engine. These were examples Rae thought would prove problematic for the theorist of technological change, for only their histories could reveal the course of their evolution. Such technologies are “generally deriving their efficiency from principles, that have been the result of very extensive and accurate investigations of many series of events” (Rae 1834:87).

Although Rae did not intend the whole of his *New Principles* as an examination of the history of technology even from a theoretical perspective, as Price discusses, he did, nonetheless, build a theory of the history of technological change, relying extensively on historical sources, as well as on his own interest in technology, his very personal experiences as inventor, and his own observations of technologies in actual use. Out of his combined historical information and theoretical ideas, Rae provided an explanation for how technological change *had taken place* in the past by means of what Price terms both a micro- and a macrotheory of the history of technological change, the former based upon his theory of the contributions of individual members to society at large, the latter upon his belief that at least ‘the principle leading to the formation of instruments’, the desire to accumulate, had to exist within a specific human culture for technological change to occur at all. Price highlights further Rae’s reflections on the causes which determine the degree of ‘technologization’ of any society, i.e., the amount of its instruments, once the initial conditions for a technological presence exist. In the end, the legitimate question of the significance of Rae’s theoretical ideas about history is posed to reveal a uniquely comprehensive relationship between, on the one hand, his history of technology, and capital theory and other divisions of natural history, and, on the other hand, his history of technology, and the theory of the history of technology and theories of fostering policies.

An example of Rae's use of both inductive analysis and historical behaviour is present in his perspective on luxury consumption. Although ostentatious economic display had already been recognized, John Rae's treatment of luxury consumption in *New Principles* added to a then meagre literature on the subject. Until Thorstein Veblen's classic 1899 treatise, *The Theory of the Leisure Class*, which owes much to Rae without acknowledgement, few economists had considered its significance, although after 1500, the case against luxury consumption had been extended beyond a claim for its being morally wrong to its being against commercial interest. Before Rae, Adam Smith, favourable successor to Mandeville's 1714 attack on the "virtues" of thrift and frugality, *The Fable of the Bees; or Private Vices, Public Benefits*, articulated that conspicuous consumption was and would be, a socially inspired part of the modern world, a functional motor of national economic effort.

Mason in "John Rae and Conspicuous Consumption" has analyzed Rae's views, finding them largely influenced by two economists. Rae's ideas were at odds with his first influence, Adam Smith, for Rae saw conspicuous consumption as unnecessary, something to be resisted; it fed off vanity, especially that of the capitalist class, and had no redeeming features. He thought it possible that a balance of the social and benevolent affections and the intellectual powers of a society could work to ensure that conspicuous consumption would be kept to manageable levels, akin to Mandeville's descriptions of the seventeenth-century Dutch Republic whose ostentatious expenditure was made in articles of quality and permanence. When the specific forces which work against too great a level of conspicuous display, ethical community and individual values, are weakened and ineffective, long-term social and economic stability is threatened.

Rae believed that the conditions in "new" countries tended to lower the overall propensity to consume conspicuously, but conceded that vanity and conspicuous consumption can be found everywhere. Luxury goods, deriving their value from their relative scarcity secured by high prices and limited availability, represented, to Rae, a loss to society, in neither supplying real wants nor increasing overall well-being. He devised some policies and prescriptions, i.e., taxation and scarcity-reducing production, to ameliorate the threats of luxury production and conspicuous consumption, but also, and, positively reflecting his second major influence, Heinrich von Storch, he tackled the root cause of the problem, vanity itself, by advocating religious education, and the moral values it secured.

II

When Rae left Scotland in 1822, the industrial revolution was at full steam. Textiles were already being produced in industrial proportions; the first train was about to roll from London to Glasgow; and the manufacturing sector was

developing at an increasing scale. In Canada, except for the exploitation of some raw materials and primary products, the economy was largely undeveloped. The contrast was so striking that it provided Rae with the stimulus for many a question about the reasons for the contrast. Canada itself presented fertile ground for study.

Rae spent years collecting data about Canada's economy and probing for the causes of economic development, particularly putting to test Smith's famous inquiry into the wealth of a nation. Rae had come to North America with a copy of Smith in hand, and it undoubtedly served him as a guide to get his investigation started. His own observations led him, however, to develop an original theory of capital, technical change, and capital accumulation. Further, through the prism of the capital theory of his *New Principles*, which, as noted above, anticipated those of Böhm-Bawerk and Fisher, Rae's critique of Smith's *Wealth of Nations*, his pioneering analysis of the role of the inventive faculty and inventions and the growth of knowledge in economic development and foreign trade, and his related argument for infant-industry protection, can all be viewed. In the third section of this collection, six chapters deal with aspects of capital.

In his chapter on "Rae, Böhm-Bawerk, and Fisher on the Supply and Demand of Capital" Ahmad goes back farther than the recent appraisals of Dorfman (1993) and Samuelson (1994) to examine contributions to capital theory by John Rae (1834), and Böhm-Bawerk (1889) and Fisher (1907), through the study of all their texts on two major themes (considered by neoclassics in terms of supply and demand analysis): the determination of the rate of interest, or profit, and the rate of economic growth. Rae's capital theory argument and illustrations were of a richness to elicit the highest praise and citation by Mill (1848), and Ahmad's objectives are to assess what Böhm-Bawerk and Fisher borrowed from Rae, whether they made significant advances or developed original ideas, and whether Rae's presentation was not the clearest, most relevant of the three. He concludes that Rae's framework is the simplest, and Fisher's, the most general. Within the general equilibrium approach, Böhm-Bawerk and Fisher did make analytical advances over Rae, but neither made any significant addition to him on the relationship of capital to growth.

Rae gave much attention to "supply of capital," particularly to factors determining its magnitude, listing six in one summary passage. Although his views are much richer than Böhm-Bawerk's (1889) and Fisher's echo, among Böhm-Bawerk's famous "Reasons" for the existence of a positive rate of interest, of which the first two are treatable as influences on the supply of capital, lies Rae's one major omission. He did not reflect on "the pattern of the flow of income over time." Explanation may be due to differences in value theory: Rae's, a modified classical, the others', a neoclassical.

Rae also contributed to "demand for capital" theory, in the area of "ultimately diminishing marginal productivity of capital, with a given state

of knowledge,” and, most powerfully, in the area of “requisite needs for an increase in knowledge through invention.” In discussing demand for capital, Rae defined “instruments,” all goods and land, and “order,” most easily understood in a point input-point output framework. Both Böhm-Bawerk and Fisher claimed outright originality in their analysis for “demand for capital” theory: Böhm-Bawerk through the “Third Reason,” “the technical superiority of present good over the future good,” in defining “capital intensity” in units of “time” in a flow input-point output framework, to yield an “average period of production,” Fisher, in his formalization of “rate of return over cost,” including reswitching.

John Rae’s intention to refute Smith’s *Causes of the Wealth of Nations* in his *New Principles* (1834) was carefully understated. His disagreement with Smith was not over the importance of capital accumulation, but its causes. It is Rae’s focus on invention as the primary cause of growth and his argument based on three claims:

- 1 that invention has causes prior to the current saving;
- 2 that laissez-faire generates a suboptimal level of invention; and
- 3 that the state should intervene,

which has caught Brewer’s attention in “Invention.”

Rae did not define “invention” explicitly, but, going from music and poetry to import substitution, he suggested a concept much broader than, for example, Schumpeter’s “innovation.” Rae went to lengths both to emphasize the gap between the “inventor,” the “man of genius,” and the mass of mankind, and to dramatize the tribulations of the former and the costs of invention-stimulating social disruption on the latter. As he turned, however, to more directly economic cases and replaced the tortured genius by inventions proceeding logically and smoothly, with “full assurance” of success, the main line of the story is revealed: societies can only continue to accumulate for any length of time by adopting new methods of production, which themselves have to be invented. This seems, however, to pose a problem, for Rae argues that saving and thus capital accumulation depend on a willingness to wait for rewards, but that invention is needed to maintain the incentive to save. The solution for Rae lies in a case for state intervention for two explicit reasons: first, it can support invention (and inventive adaptation), for invention has causes which government policy can stimulate; and second, it can support infant industries.

There are parallels between Rae’s ideas and those of Joseph Schumpeter: the pragmatic application of a new idea is followed by copying, and the total social benefit accruing from any innovation is only partly captured by the innovator. They held, however, conflicting views on the immediate consequences of innovation, with Schumpeter drawing sharply between invention and innovation and emphasizing the temporary lead and profit gain

of the innovator over imitators, and Rae stressing instead the extra novelty cost incurred by the innovator. Technological import substitution thus provided the context for Rae's case for action by the "legislator." The state is needed to help set up production in new circumstances, for while emphasizing there are potential gains, Rae stressed the immediate start-up difficulties involved.

Rae began his critique of Smithian economics by arguing that Smith "in great measure misses that which is the real object at which his inquiry aims, the instigation of the true nature and causes of national wealth," and takes "what in truth are the results of general laws...for the laws themselves, and of so elevating effects into causes." Rae argues therefore that, since capital, or wealth, is the result of fundamental human activities, one should not study it as the cause, as he suggests Smith did, but rather those individual and collective activities which give rise to capital/wealth. In "John Rae: Capital and Growth Theory" Rymes advances that Rae was concerned especially with the individual and collective activity—individual, noting Smith's lack of distinction between individual and national wealth; collective, given his advocated role for the state in infant industry protection, and so on—of the effective desire of accumulation which directly codeter-mines rates of technical advance and rates of return to capital, which in turn codetermine rates of growth and capital accumulation. According to Rymes' analysis, Rae proceeded basically "in the neo-classical way," "aside from an Austrian sideslip."

Rae attributes wealth, or the stock of capital or instruments, in any society to four specific elements, of which two are the strength of the effective desire of accumulation and the progress of the inventive faculty. Rymes formulates equations to represent the relationship of these elements to wealth creation in Rae. For effective accumulation, since Rymes has only Rae's definition of the desire, or "the determination to sacrifice a certain amount of present good to obtain another greater amount at some future period," (or p , the rate of time preference) to go on, he turns to more current growth theories to determine that Rae means $n' = n'(R; \rho)$ dynamically, and, in steady state, $R = n' + \rho$, where R is the real rate of return and n' , the Harroddian rate of technical progress: the higher n' , the higher R . He considers this reduction valid, for in a given state of knowledge, the greater the effective desire of accumulation, the lower would be the rate of time preference (and the greater the rate of saving); in a neoclassical endogenous-growth theoretical world in which diminishing returns to capital have been set aside, a lower rate of time preference (or a higher rate of saving) would also be associated with a higher rate of growth; and in the neo-Keynesian models, a higher rate of savings associated with a lower rate of time preference, leads, given n' , to a lower R and hence, through $n' = n'(R)$, to a lower n' . For inventive activity, given Rae's declaration that it is invention which shows how profitable returns may be got from capital, Rymes gives $R = R(n')$.

In “Productive Savings, Invention, Investment Supply in Rae’s Growth Theory,” Gootzeit examines Rae’s recommendation in the *New Principles* for rapid capital augmentation to increase per capita wealth nationally by analyzing Rae’s appreciation of savings in relation to capital. He sees Rae downplaying personal savings to give more importance to the “productive” savings of the business sector. For Rae, personal savings lead to the formation of “personal instruments,” or durable consumption goods, while business savings lead to the formation of “business instruments,” or “capital.” Rae saw the “augmentation” of capital stock by the business sector as a different process from the “accumulation” of durables by individuals, because, while individuals buy “the same old things” over and over, businesses purchase newly invented or adapted, technically improved capital goods for their potential to increase profits. Hence, the primary force of augmentation is technical improvement: after an invention takes place, businesses immediately desire to raise their rate of savings (*new instruments retained*) and invest, perhaps through direct lending from businesses one to another (*new instruments given on credit*).

Gootzeit illustrates in linear version an investment supply model he developed from Rae’s *New Principles* in which k is any positive parameter, and also in which, when $k=1$, the simplification to the equation $(P_{RE}-i)=Wc$ of the equation $(P_{RE}-i)=GT(1-k)+Wc$ is possible (where P_{RE} =the expected general/average profit rate in the production of capital instruments, Wc =the capitalist’s wage, and G =the average profitability of T , *technical improvement*). In this latter case, where Wc is constant, the differential between P_{RE} and i remains constant when T increases. If, however, $k>1$, $(1-k)<0$, and when T increases, $(P_{RE}-i)$ falls toward zero as/increases faster than P_{RE} .

Gootzeit ends discussion of the model and his chapter on the possible implication of a short-run direct relation between invention and the rate of interest which Böhm-Bawerk, Mixer and Fisher criticized as a part of Rae’s theory: invention would cause the interest rate to rise. Considering Rae misunderstood, Gootzeit asserts that the only theoretical mechanism left to Rae for making the attributed prediction was that invention caused the expected profit rate to rise and that this somehow contributed to the interest increase. Inversely, however, he notes, rapid increase in market interest rate would cause a reduction in the volume of credit through a breakdown in the credit allocation, when otherwise investment would expand smoothly as technology improves.

The subtitle of John Rae’s *New Principles* proclaimed its “Exposing the Fallacies of the System of FREE TRADE, and of Some Other Doctrines Maintained in the *Wealth of Nations*.” Although, not surprisingly, Rae’s book was construed as a polemic against Adam Smith, Dimand observes that Rae’s analysis of international trade is linked in spirit to the *Wealth of Nations*, Book 1, where Smith discussed the division of labour and made a

case for free trade's offering greater market extension. It is instead Rae's rejection of Smith's "identification" of saving rather than invention as the mainspring of economic development that Dimand sees as the root of the polemics in "Rae and International Trade." His rejection primarily of Smith's claim, that, if the state were not to promote the establishment of new industry using imported technology, the nation's capital would be just as profitably employed, is thus the focus of Dimand's chapter, "Rae and International Trade."

By March 1825 Rae had formulated his basic infant industry argument for government protection and international trade, along with a sketchy anticipation of his later analysis of invention as augmentor of capital stock. Rae used the establishment of England's woollen manufacture to advance his test for government encouragement: although an industry might not be privately profitable at first, given factor prices, is there the promise of future successful competition? Rae first illustrated his claim with industries using domestic raw materials, but extended it to the use of imported inputs in the case where the classical assumption of full employment of resources fails to hold. Rae endorsed government support for the invention of machines to facilitate and abridge labor in granting patents or in paying compensation for an invention made freely available. In contrast to the mercantile system denounced by Adam Smith, government intervention was for Rae to be temporary.

In response to Smith's classical case for free trade, the crucial innovation of Rae's analysis of gains from trade was his consideration that the opportunity to make beneficial international exchanges was equivalent to invention in stimulating economic growth. It allowed increased consumption from the same resources by raising the internal rate of return, by carrying capital goods more quickly through the period in which their issue is double the labour expended in forming them, and by thus creating an incentive, and hence a desire, to increase capital stock and productive capacity.

Maneschi in his chapter "John Rae and the Promotion of Infant Industries" emphasizes yet further the connection between Rae's capital theory and his trade policies, specifically with respect to infant industries. As noted above, Rae made two fundamental contributions which came to the attention of John Stuart Mill through Nassau Senior: his argument in favor of the promotion of infant industries and his pioneering capital theory. The circumstances surrounding infant industries are mainly analyzed in Book I of the *New Principles*, devoted to a critique of Adam Smith's *Wealth of Nations*, while his capital theory was formulated in Book II. Related policy implications for the transfer of technology from abroad are outlined in Book III, which, according to Maneschi, would have been the logical place to combine the advocacy of infant promotion of Book I with the capital-theoretic framework of Book II, particularly since Rae's position on the former pertains to capital theory,

rather than trade theory. Instead Rae decided to devote the last book to the policy implications for legislators.

Although his powerful advocacy of the promotion of infant industries, and the full title of his book, might suggest that Rae was opposed to free trade, Maneschi asserts, like Hollander to follow, that he was not, and examines the question of whether it was consistent of Rae simultaneously to support free trade and the promotion of infant industries by various means, including duties. Maneschi reminds his readers that, although according to mainstream international-trade theory, free trade is optimal if certain static assumptions are satisfied—for example, a given technology, given factors of production and a frictionless and timeless movement along a given production possibility surface—these assumptions are not relevant to an analysis of infant industries, which focuses on the introduction of a new technology and the accompanying benefits and costs. At the same time as criticizing Smith, especially Book 4 of the *Wealth of Nations* which contains the principal elements of his foreign trade theory, Rae, in proposing what came to be known as the “Mill test,” “the commodity, the product of the art in question, comes to be made at the same cost in the country to which its manufacture is transferred, as in that from which it comes, or at less cost than there” (Rae 1834:364), was establishing his own criterion for a successful infant industry and a policy of raising a society’s profit rate. Rae, like Hamilton, advocated caution in recommending candidates for promotion as infant industries, but felt the successes, just like free trade, would improve the world allocation of resources.

III

The last four chapters of the present volume are devoted to Rae’s contributions to the development of economic ideas in the history of economic thought. In terms of his intellectual heritage, Rae is in general representative of the Scottish tradition of political economy, which both Macfie (1955) and Dow (1987) have identified, but he is also unrepresentative in some key respects. For example, Macfie (1955) sees Rae as only a “considerable satellite,” in the same category as Lauderdale, Hutcheson and McCulloch.

It is argued that it is the Scottish context of Rae’s upbringing which allows for any expectation that Rae might represent the Scottish tradition. Rae’s education was indeed in Scotland as well as in Paris (the Auld Alliance and all that), and his formative years as an economist in Canada were spent in a milieu which was seeking to preserve traditional Scottish values in religion and education. Some of Rae’s ideas might well thus by reason of his education be encompassed within the larger idea of a Scottish political economy tradition whose influence has survived to some degree in Scotland