

---

THE NEW  
PALGRAVE  
A DICTIONARY OF  
ECONOMICS

---

EDITED BY  
JOHN EATWELL  
MURRAY MILGATE  
PETER NEWMAN

M

THE MACMILLAN PRESS LIMITED, LONDON  
THE STOCKTON PRESS, NEW YORK  
MARUZEN COMPANY LIMITED, TOKYO

© The Macmillan Press Limited, 1987

All rights reserved.

No part of this publication may be reproduced or transmitted,  
in any form or by any means, without permission.

*The New Palgrave: A Dictionary of Economics*  
Edited by John Eatwell, Murray Milgate and Peter Newman  
in four volumes, 1987

Published in the United Kingdom by  
THE MACMILLAN PRESS LIMITED, 1987  
London and Basingstoke

Associated companies in Auckland, Delhi, Dublin, Gaborone, Hamburg,  
Harare, Hong Kong, Johannesburg, Kuala Lumpur, Lagos, Manzini,  
Melbourne, Mexico City, Nairobi, New York, Singapore, Tokyo.

Published in the United States of America and Canada by  
THE STOCKTON PRESS, 1987  
15 East 26th Street, New York, NY10010, USA

Published in Japan by  
MARUZEN COMPANY LIMITED, 1987  
3-10, Nihonbashi 2-Chome, Chuo-Ku, Tokyo 103, Japan

Reprinted 1988 (twice)

The New Palgrave is a trademark of The Macmillan Press Limited

**Library of Congress Cataloging-in-Publication Data**

The New Palgrave: a dictionary of economics  
Sequel to: Dictionary of political economy/Robert  
Harry Inglis Palgrave. 1910.

Bibliography: p.

Includes index.

I. Economics --Dictionaries. I. Eatwell, John.  
II. Milgate, Murray. III. Newman, Peter K. 1928 .  
IV. Palgrave, Robert Harry Inglis, Sir, 1827-1919.

Dictionary of political economy.

HB61.N49      330'.03'21      87 1946

ISBN 0-935859-10-1 (set)

**British Library Cataloguing in Publication Data**

The New Palgrave: a dictionary of economics

I. Economics--Dictionaries

I. Eatwell, John. II. Milgate, Murray

III. Newman, Peter.

330.03'21      HB61

ISBN 0-333-37235-2

Text keyboarded by Morton Word Processing Ltd, Scarborough, North Yorkshire.  
Database management and text composition by Pergamon Orbit InfoLine Ltd, London.  
Typeset by A. Wheaton & Co. Ltd, Exeter, Devon.  
Printed and bound in Hong Kong.

# LIST OF ENTRIES    A – Z

One-line cross-references are shown in *italics*.

- Abbott, Edith (1876–1957)  
Abramovitz, Moses (born 1912)  
absentee  
absolute and exchangeable value  
*absolute income hypothesis*  
absolute rent  
absorption approach to the balance of payments  
absorptive capacity  
abstinence  
abstract and concrete labour  
*acapitalistic production*  
acceleration principle  
accounting and economics  
accumulation of capital  
*activity analysis*  
acyclicity  
Adams, Henry Carter (1851–1921)  
adaptive expectations  
*added worker effect*  
adding-up problem  
*additive preferences*  
*additive utility function*  
adjustment costs  
adjustment processes and stability  
administered prices  
advances  
adverse selection  
advertising  
advisers  
Aftalion, Albert (1874–1956)  
ageing populations  
agency costs  
agent  
agents of production  
aggregate demand and supply analysis  
aggregate demand theory  
*aggregate production function*  
aggregate supply function  
aggregation of economic relations  
aggregation problem  
*agrarianism*  
agricultural economics  
agricultural growth and population change  
agricultural supply  
agriculture and economic development  
aid  
Akerman, Johan Gustav (1888–1959)  
Akerman, Johan Henrik (1896–1982)  
Alchian, Armen Albert (born 1914)  
alienation  
Allais, Maurice (born 1911)  
Allais paradox  
Allen, George Cyril (1900–1982)  
Allen, Roy George Douglas (1906–1983)  
*allocation*  
*allocation: strategy-proof mechanisms*  
*allocation of time*  
Almon, Shirley Montag (1935–1975)  
Almon lag  
*alternative technology*  
altruism  
American Economic Association  
Amoroso, Luigi (1886–1965)  
amortization  
analogy  
*analysis of variance*  
anarchism  
Anderson, James (1739–1808)  
Anderson, Oskar Nikolayevich (1887–1960)  
Andreades, Andreas (1876–1935)  
Andrews, Philip Walter Sawford (1914–1971)  
Angell, James Waterhouse (1898–1986)  
*animal spirits*  
anomalies  
*anthropology, economic*  
antitrust policy  
Antonelli, Giovanni Battista (1858–1944)  
Aoyama, Hideo (born 1910)  
appropriate technology  
Aquinas, St Thomas (1225–1274)  
arbitrage  
arbitrage pricing theory  
arbitration  
ARIMA models  
Aristotle (384–322 BC)  
arms races  
Armstrong, Wallace Edwin (1892–1980)  
Arndt, Heinz Wolfgang (born 1915)  
*Arrow corner*  
Arrow–Debreu model of general equilibrium  
Arrow's theorem  
arts  
Asgill, John (1659–1738)  
Ashley, William James (1860–1927)  
Ashton, Thomas Sutcliffe (1889–1968)  
asset pricing  
assets and liabilities  
assignment problems  
asymmetric information  
atomistic competition  
*attributes*  
Attwood, Thomas (1783–1856)  
auctioneer  
auctions  
Aupetit, Albert (1876–1943)  
Auspitz, Rudolf (1837–1906)  
*Austrian conceptions of competition*  
Austrian School of Economics  
autarky  
*autocorrelation*  
*automatic stabilizers*  
autonomous expenditures  
autoregressive and moving-average time-series processes  
*autoregressive-integrated-moving average models*  
*average and normal conditions*  
average cost pricing  
*average industry*  
*average period of production*  
Averch–Johnson effect  
axiomatic theories  
Ayres, Clarence Edwin (1891–1972)  
Babbage, Charles (1791–1871)  
Babeuf, François Noël (1764–1797)  
Bachelier, Louis (1870–1946)  
backwardation  
*backward bending supply curve*  
*backward linkage*  
backwardness  
Bagehot, Walter (1826–1877)  
Bailey, Samuel (1791–1870)  
Bain, Joe Staten (born 1912)  
Bakunin, Mikhail Alexandrovitch (1814–1876)  
balanced budget multiplier  
balanced growth  
*balance of payments*  
balance of trade, history of the theory  
*balance of trade doctrine*  
*balance sheet*  
Balogh, Thomas (1905–1985)  
Banfield, Thomas Charles (1800–?1882)  
Banking School, Currency School, Free Banking School  
bank rate  
banks  
Baran, Paul Alexander (1910–1964)  
Barbon, Nicholas (1637/40–?1698)  
bargaining  
Barone, Enrico (1859–1924)  
*barriers to entry*  
barter  
barter and exchange  
Barton, John (1789–1852)  
basics and non-basics  
basing point system

- Bastable, Charles Francis** (1855-1945)  
**bastard Keynesianism**  
**Bastiat, Claude Frédéric** (1801-1850)  
**Baudeau, Nicolas** (1730-*c*1792)  
**Bauer, Otto** (1881-1938)  
**Bauer, Peter Tamas** (born 1915)  
**Bayes, Thomas** (1702-1761)  
**Bayesian inference**  
**Beccaria, Cesare Bonsana, Marchese di** (1738-1794)  
**Beeke, Henry** (1751-1837)  
**Beer, Max** (1864-1943)  
**beggar-thy-neighbour**  
**behavioural economics**  
**benefit principle**  
**Bentham, Jeremy** (1748-1832)  
**Bergson, Abram** (born 1914)  
**Berkeley, George** (1685-1753)  
**Berle, Adolf Augustus, Jr.** (1895-1971)  
**Bernoulli, Daniel** (1700-1782)  
**Bernoulli, James [Jakob, Jacques]** (1654-1705)  
**Bernstein, Eduard** (1850-1932)  
**Berry, Arthur** (1862-1929)  
**Bertalanffy, Ludwig von** (1901-1972)  
**Bertrand, Joseph Louis François** (1822-1900)  
**best linear unbiased estimator (BLUE)**  
**Bettelheim, Charles** (born 1913)  
**Beveridge, William Henry** (1879-1963)  
**biased and unbiased technological change**  
**Bickerdike, Charles Frederick** (1876-1961)  
**bidding**  
**bid-rent function**  
**bilateral monopoly**  
**bimetallism**  
**bioeconomics**  
**biological applications of economics**  
**Birck, Laurits Vilhelm** (1871-1933)  
**Birmingham School**  
**birth-and-death processes**  
**birth rate**  
**Black, Duncan** (born 1908)  
**black market**  
**Blake, William** (*c*1774-1852)  
**Blanc, Louis Joseph Charles** (1811-1882)  
**Blanqui, Jérôme-Adolphe** (1798-1854)  
**bliss**  
**Bloch, Marc** (1886-1944)  
**Bodin, Jean** (1530-1596)  
**Böhm-Bawerk, Eugen von** (1851-1914)  
**Boisguilbert, Pierre le Pesant, Sieur de** (1645-1714)  
**Bonar, James** (1852-1941)  
**bonds**  
**booms and slumps**  
**Borda, Jean-Charles de** (1733-1799)  
**Bortkiewicz, Ladislaus von** (1868-1931)  
**Boulding, Kenneth Ewart** (born 1910)  
**bounded rationality**  
**bounties**  
**bourgeoisie**  
**Bowley, Arthur Lyon** (1869-1957)  
**Bowley, Marian** (born 1911)  
**Bowman, Mary Jean** (born 1908)  
**Boyd, Walter** (1754-1837)  
**Brady, Dorothy Stahl** (1903-1977)  
**brain drain**  
**Braudel, Fernand** (1902-1985)  
**Braverman, Harry** (1920-1976)  
**Bray, John** (1809-1897)  
**Breckinridge, Sophonisba Preston** (1866-1948)  
**Brentano, Lujo (Ludwig Josef)** (1844-1931)  
**Bresciani-Turroni, Costantino** (1882-1963)  
**Bretton Woods**  
**bribery**  
**Bright, John** (1811-89)  
**Bronfenbrenner, Martin** (born 1914)  
**Brougham, Henry** (1773-1868)  
**Brown, (Ernest) Henry Phelps**  
**Brown, Harry Gunnison** (1880-1975)  
**Brownian motion**  
**Brydges, Samuel Egerton** (1762-1837)  
**bubbles**  
**Buchanan, David** (1779-1848)  
**Bücher, Karl Wilhelm** (1847-1930)  
**Buckle, Henry Thomas** (1821-1862)  
**budgetary policy**  
**budget constraint**  
**budget deficit**  
**buffer stocks**  
**built-in stabilizers**  
**Bukharin, Nikolai Ivanovitch** (1888-1938)  
**Bullionist Controversy**  
**Bullock, Charles Jesse** (1869-1941)  
**bunch maps**  
**burden of the debt**  
**bureaucracy**  
**Buridan, Jean** (*c*1295-1356)  
**Burke, Edmund** (1729-1797)  
**Burns, Arthur Frank** (1904-1987)  
**Burns, Arthur Robert** (1895-1981)  
**Burns, Emile** (1889-1972)  
**Burns, Eveline Mabel** (1900-1985)  
**business cycles**  
**by-products**  
**Cairnes, John Elliott** (1823-1875)  
**calculus of variations**  
**cameralism**  
**Canard, Nicolas-François** (*c*1750-1833)  
**Cannan, Edwin** (1861-1935)  
**Cantillon, Philip** (*fl.* 1725-1759)  
**Cantillon, Richard** (1697-1734)  
**capital, circulating**  
**capital, constant**  
**capital, credit and money markets**  
**capital, fictitious**  
**capital, fixed**  
**capital, measurement of**  
**capital, quantity of**  
**capital accumulation**  
**capital as a factor of production**  
**capital as a social relation**  
**capital asset pricing model**  
**capital budgeting**  
**capital controversy**  
**capital flight**  
**capital gains and losses**  
**capital goods**  
**capitalism**  
**capitalism, contradictions of**  
**capitalistic and acapitalistic production**  
**capitalization**  
**capital markets**  
**capital perversity**  
**capital structure**  
**capital taxation**  
**capital theory: debates**  
**capital theory: paradoxes**  
**capital utilization**  
**Carey, Henry Charles** (1793-1879)  
**Carey, Mathew** (1760-1839)  
**Carlyle, Thomas** (1795-1881)  
**Carroll, Lewis** (Charles Lutwidge Dodgson) (1832-1898)  
**cartel**  
**Carver, Thomas Nixon** (1865-1961)  
**cash balances**  
**Cassel, Gustav** (1866-1944)  
**cataclastics**  
**catastrophe theory**  
**catching-up**  
**Cattaneo, Carlo** (1801-1861)  
**causal inference**  
**causality in economic models**  
**Cazenove, John** (1788-1879)  
**censored data models**  
**central banking**  
**centralization**  
**central place theory**  
**central planning**  
**centre of gravitation**  
**certainty equivalent**  
**CES production function**  
**ceteris paribus**  
**Ceva, Giovanni** (1647/48-1734)  
**Chadwick, Edwin** (1800-1890)  
**Chalmers, Thomas** (1780-1847)  
**Chamberlin, Edward Hastings**  
**Champernowne, David Gawen** (born 1912)  
**chance**  
**changes in tastes**  
**characteristics**  
**charity**  
**chartism**  
**chartism: the points of the Charter**  
**Chayanov, Alexander Vasil'evich** (1888-*?*1939)  
**cheap money**  
**Cherbuliez, Antoine Elisée** (1797-1869)  
**Chernyshevskii, Nikolai Garilovich** (1828-1889)  
**Chevalier, Michel** (1806-1879)  
**Cheysson, Jean-Jacques Emile** (1836-1910)  
**Chicago School**  
**Child, Josiah** (1630-1699)  
**choice of technique and rate of profit**  
**choice theory**  
**chrematistics**

- Christaller, Walter (1894-1975)  
 Christian Socialism  
 circular flow  
 circulating capital  
*circulating media*  
 Clapham, John Harold (1873-1946)  
 Clark, Colin Grant (born 1905)  
 Clark, John Bates (1847-1938)  
 Clark, John Maurice (1884-1963)  
 class  
*classical conceptions of competition*  
 classical economics  
 classical growth models  
*classical theory of distribution*  
 classical theory of money  
*classical theory of production*  
*classical theory of wages*  
 classification  
 Cliffe Leslie, Thomas Edward (1827-1882)  
 cliometrics  
*closed systems*  
 clubs  
*coalitions*  
 Coase, Ronald Harry (born 1910)  
 Coase Theorem  
 Cobb-Douglas functions  
 Cobbett, William (1763-1835)  
 Cobden, Richard (1804-1865)  
 cobweb theorem  
 Coddington, Alan (1941-1982)  
 codetermination and profit-sharing  
 Coghlan, Timothy (1855-1926)  
 Cohen, Ruth Louisa (born 1906)  
 Cohen Stuart, Arnold Jacob (1855-1921)  
 Cohn, Gustav (1840-1919)  
 Colbert, Jean-Baptiste (1619-1683)  
 Colbertism  
 Cole, George Douglas Howard (1889-1959)  
 collective action  
 collective agriculture  
 collective bargaining  
 collective goods  
*collegium*  
 Collet, Clara Elizabeth (1860-1948)  
 collusion  
 colonialism  
 colonies  
 Colquhoun, Patrick (1745-1820)  
 Colson, Léon Clément (1853-1939)  
 Colwell, Stephen (1800-1871)  
 combination  
 combinatorics  
 command economy  
*commerce*  
 commodities  
*commodities, contingent*  
 commodity fetishism  
 commodity money  
*commodity price stabilization*  
 commodity reserve currency  
 common land  
 common law  
 common markets  
 common property rights  
 Commons, John Rogers (1862-1945)  
 communications  
 communism  
*communism, full*  
 community indifference curves  
 comparative advantage  
 comparative statics  
 compensated demand  
*compensation*  
 compensation principle  
 competition  
 competition: Austrian conceptions  
 competition: classical conceptions  
 competition: marxian conceptions  
*competition, imperfect*  
*competition, monopolistic*  
*competition, perfect*  
 competition and efficiency  
 competition and selection  
*competition and stability*  
 competition in international trade  
 competition policy  
 competitive market processes  
 complementarity  
 computation of general equilibria  
 Comte, Auguste (1798-1857)  
 concavity  
 concentration ratios  
 Condillac, Etienne Bonnot de (1714-1780)  
 Condorcet, Marquis de (1743-1794)  
 conflict and settlement  
 congestion  
 conglomerates  
 conjectural equilibria  
*conjectural variation*  
*consols (Consolidated Fund)*  
 conspicuous consumption  
 constant and variable capital  
*constant elasticity of substitution*  
*production function*  
*constant returns*  
 constitutional economics  
*constraint qualification*  
 consumer durables  
 consumers' expenditure  
 consumer surplus  
*consumption, conspicuous*  
 consumption and production  
 consumption function  
*consumption-loan models*  
 consumption sets  
 consumption taxation  
 contestable markets  
 contingent commodities  
 continuity in economic history  
 continuous and discrete time models  
 continuous-time stochastic models  
 continuous-time stochastic processes  
*continuum economies*  
*contract curve*  
*contract theory*  
 contradiction  
 contradictions of capitalism  
 control and coordination of economic activity  
 convergence hypothesis  
 convexity  
 convex programming  
 cooperative equilibrium  
 cooperative games  
 co-operatives  
 Copland, Douglas Berry (1894-1971)  
 cores  
 Corn Laws  
 corn model  
 corporate economy  
*corporate taxation*  
 corporations  
 corporatism  
*correlation analysis*  
 correspondence principle  
 correspondences  
 Cossa, Luigi (1831-1896)  
 cost and supply curves  
 cost-benefit analysis  
 cost functions  
 cost minimization and utility maximization  
*cost of living*  
 cost of production  
*cost-plus pricing*  
 cost-push inflation  
*costs of adjustment*  
 counterfactuals  
 countertrade  
 countervailing power  
 Courcelle-Seneuil, Jean Gustave (1813-1892)  
 Cournot, Antoine Augustin (1801-1877)  
 Court, Louis Mehel (born 1910)  
 crawling peg  
 creative destruction  
 credit  
 credit cycle  
*credit markets*  
 credit rationing  
 crime and punishment  
 crises  
 critical path analysis  
 Croce, Benedetto (1866-1952)  
 Crosland, Anthony (1918-1977)  
*cross-elasticity*  
*cross-section analysis*  
 crowding out  
 Crowther, Geoffrey (1907-1972)  
 culture  
 cumulative causation  
 cumulative processes  
 Cunningham, William (1849-1919)  
 Cunynghame, Henry Hardinge (1848-1935)  
 currencies  
 currency boards  
*Currency School*  
 Currie, Lauchlin Bernard (born 1902)  
 custom  
 customs unions  
 cycles in socialist economies  
*cyclical fluctuations*

- Dalton, Edward Hugh John Neale, (1887–1962)  
*Darwinism*  
 Davanzati, Bernardo (1529–1606)  
 Davenant, Charles (1656–1714)  
 Davenport, Herbert Joseph (1861–1931)  
 Davidson, David (1854–1942)  
 dear money  
 death duties  
 death processes  
 death rate  
 débouchés, théorie des  
 debt  
 decentralization  
 decision theory  
 declining industries  
 declining population  
 defence economics  
 deficit financing  
 deficit spending  
 De Finetti, Bruno (1906–1985)  
 Defoe, Daniel (1660–1731)  
 degree of monopoly  
 degree of utility  
 deindustrialization  
 delivery lags  
 Del Mar, Alexander (1836–1926)  
 Del Vecchio, Gustavo  
 De Malynes, Gerard  
 demand, empirical studies of  
 demand, integrability of  
 demand for money: empirical studies  
 demand for money: theoretical studies  
 demand management  
 demand price  
 demand-pull inflation  
 demand theory  
 demographic transition  
 demography  
 De Moivre, Abraham (1667–1754)  
 dependency  
 depletion  
 depopulation  
 depreciation  
 depressions  
 De Quincey, Thomas (1785–1859)  
 deregulation  
 derived demand  
 de-skilling  
 Destutt de Tracy, Antoine Louis Claude (1754–1836)  
 determinism  
 De Tocqueville, A  
 devaluation  
 developing countries, fiscal and monetary policies  
 development economics  
 development planning  
 De Viti de Marco, Antonio  
 dialectical materialism  
 dialectical reasoning  
 Dickinson, Henry Douglas (1899–1969)  
 Diderot, Denis (1713–1784)  
 Dietzel, Carl August (1829–1884)  
 Dietzel, Heinrich (1857–1935)  
 differential games  
 difference principle  
 differential rent  
 differential topology  
 difficulty of attainment  
 difficulty or facility of production  
 diffusion of technology  
 dimensional invariance  
 dimensions of economic quantities  
 diminishing returns  
 directly unproductive profit-seeking (DUP) activities  
 direct taxes  
 discommodities  
 discount  
 discrete choice models  
 discrete time models  
 discriminating monopoly  
 discrimination  
 diseconomies of scale  
 disequilibrium analysis  
 disguised unemployment  
 disintermediation  
 distance functions  
 distortions  
 distributed lags  
 distribution, ethics of  
 distribution, law of  
 distribution-free estimation  
 distribution-free methods  
 distribution theories: classical  
 distribution theories: Keynesian  
 distribution theories: Marxian  
 distribution theories: neoclassical  
 distributive justice  
 diversification of activities  
 divided populations and stochastic models  
 dividend policy  
 Divisia, François Jean Marie (1889–1964)  
 Divisia index  
 division of labour  
 Dmitriev, Vladimir Karpovich (1868–1913)  
 Dobb, Maurice Herbert (1900–1976)  
 Dodgson, Charles Lutwidge  
 Domar, Evsey David (born 1914)  
 Domesday Book  
 domestic labour  
 Donisthorpe, Wordsworth (1847–?)  
 Dorfman, Joseph (born 1904)  
 double-entry bookkeeping  
 Douglas, Clifford Hugh (1879–1952)  
 Douglas, Paul Howard (1892–1976)  
 dual economies  
 duality  
 Dühring, Eugen Karl (1833–1921)  
 dummy variables  
 dumping  
 Dunbar, Charles Franklin (1830–1900)  
 Dunlop, John Thomas (born 1914)  
 Dunoyer, Barthélémy Charles Pierre Joseph (1786–1862)  
 duopoly  
 DUP activities  
 Du Pont de Nemours, Pierre Samuel (1739–1817)  
 Dupuit, Arsène-Jules-Émile Juvenal (1804–1866)  
 Durand, David (born 1912)  
 duration of life  
 Durbin, Evan Frank Mottram (1906–1948)  
 Durkheim, Émile (1858–1917)  
 dynamic programming and Markov decision processes  
 Easterlin hypothesis  
 East–West economic relations  
 Eckstein, Otto (1927–1984)  
 Ecole Nationale des Ponts et Chaussées  
 econometrics  
 economic anthropology  
 economic calculation in socialist economies  
 economic freedom  
 economic goods  
 economic growth  
 economic harmony  
 economic history  
 economic integration  
 economic interpretation of history  
 economic laws  
 economic man  
 economic organization and transaction costs  
 economics and philosophy  
 economics and politics  
 economics and psychology  
 economics and race  
 economic science and economics  
 economics libraries and documentation  
 economics of sports  
 economic surplus and the equimarginal principle  
 economic theory and the hypothesis of rationality  
 economic theory of the state  
 economic war  
 economies and diseconomies of scale  
 économistes  
 Eden, Frederick Morton (1766–1809)  
 Edgeworth, Francis Ysidro (1845–1926)  
 Edgeworth as a statistician  
 Edgeworth, Maria (1767–1849)  
 education, economics of  
 effective demand  
 effective protection  
 'effectual demand' in Adam Smith  
 efficient allocation  
 efficient market hypothesis  
 egoism  
 Einaudi, Luigi (1874–1961)  
 Einzig, Paul (1897–1973)  
 elasticities approach to the balance of payments  
 elasticity  
 elasticity of substitution  
 elections  
 Ellet, Charles, Jr. (1810–1862)  
 Ely, Richard Theodore (1854–1943)  
 embargo

- emigration  
 empiricism  
 employer  
 employment, full  
 employment, theories of  
 empty boxes  
 enclosures  
 endogeneity and exogeneity  
 endogenous and exogenous money  
 endowments  
 energy economics  
 enforcement  
 Engel, Ernst (1821-1896)  
 Engel curve  
 Engel's Law  
 Engels, Friedrich (1820-1895)  
 English historical school  
 enlightenment  
 entitlements  
 entrepreneur  
 entropy  
 entry and market structure  
 envelope theorem  
 environmental economics  
 envy  
*Ephémérides du citoyen ou chronique de l'esprit national*  
 epistemological issues in economics  
 equality  
 equal rates of profit  
 equation of exchange  
 equilibrium: an expectational concept  
 equilibrium: development of the concept  
 equity  
*equivalent income scales*  
 ergodic theory  
 Erhard, Ludwig (1897-1977)  
 Erlich, Alexander (1913-1985)  
 error, law of  
 errors in specification  
 errors in variables  
 estimation  
 Eucken, Walter (1891-1950)  
 Euler's Theorem  
 Eurodollar Market  
 Evans, Griffith Conrad (1887-1973)  
 evolution  
 examples  
 ex ante and ex post  
 excess capacity  
 excess demand and supply  
 exchange  
*exchangeable value*  
 exchange control  
 exchange rate policy  
 exchange rates  
 excise duties  
 exhaustible resources  
 existence of general equilibrium  
 exit and voice  
 exogeneity  
 exogenous money  
 expectational equilibrium  
 expectation of life  
 expectations  
 expected utility and mathematical expectation  
 expected utility hypothesis  
*expenditure functions*  
 expenditure tax  
 expense curve  
 experience  
 experimental methods in economics (i)  
 experimental methods in economics (ii)  
 exploitation  
 export-led growth  
 exports  
 extended family  
 extended reproduction  
 extensive and intensive rent  
 extensive form games  
 external debt  
 external economies  
 externalities  
 extortion  
 Fabian economics  
 Fabricant, Solomon (born 1906)  
 factor analysis  
*factor-price equalization theorem*  
 factor-price frontier  
 factor reversals  
 factory system  
 facts  
 fair division  
 fairness  
*fairs and markets*  
 falling rate of profit  
 false trading  
 family  
 family allowance  
 family planning  
 famine  
 'Famous Fiction'  
 Fanno, Marco (1878-1965)  
 farm economics  
 farming  
 Farr, William (1807-1883)  
 Farrell, Michael James (1926-1975)  
 fascism  
 fashion  
 Fasiani, Mauro (1900-1950)  
 Faustmann, Martin (1822-1876)  
 Fawcett, Henry (1833-1884)  
 Fawcett, Millicent Garrett (1847-1929)  
 Fay, Charles Ryle (1884-1961)  
 fecundity  
 federalism  
 Fel'dman, Grigorii Alexandrovich (1884-1958)  
 Fellner, William John (1905-1983)  
 female labour force participation  
 Ferguson, Adam (1723-1815)  
 Ferrara, Francesco (1810-1900)  
 fertility  
 fetishism  
 Fetter, Frank Albert (1863-1949)  
 Fetter, Frank Whitson (born 1899)  
 feudalism  
 fiat money  
 Fichte, Johann Gottlieb (1762-1814)  
 fictitious capital  
*fiducial inference*  
 fiduciary issue  
 final degree of utility  
 final utility  
 finance  
 finance and saving  
 finance capital  
 financial crisis  
 financial intermediaries  
 financial journalism  
 financial markets  
*financial markets, spot and forward*  
 Finetti, Bruno de  
 fine tuning  
 Finley, Moses (1912-1986)  
 firm, theory of the  
 fiscal and monetary policies in developing countries  
 fiscal federalism  
 fiscal policy  
 fiscal stance  
 Fisher, Irving (1867-1947)  
 Fisher, Ronald Aylmer (1890-1962)  
 fisheries  
 fixed capital  
 fixed exchange rates  
 fixed factors  
 fixed point theorems  
 fixprice models  
 Fleming, John Marcus (1911-1976)  
 flexible exchange rates  
*flexprice models*  
 floating exchange rates  
 Florence, Philip Sargent (1890-1982)  
 flow of capital  
 flow of funds  
 flows and stocks  
 Flux, Alfred William (1867-1942)  
 Forbonnais, François Véron Duverger de (1722-1800)  
 forecasting  
 forced labour  
 forced saving  
 foreign advisers  
 foreign aid  
 foreign investment  
 foreign trade  
 foreign trade multiplier  
 forests  
 forward markets  
 Fourier, François Marie Charles (1772-1837)  
 Foxwell, Herbert Somerton (1849-1936)  
 Franklin, Benjamin (1706-1790)  
 fraud  
 free banking  
 free disposal  
 freedom  
 free enterprise  
 free entry  
 free goods  
 free lunch  
 free rider  
 free trade and protection  
 frictional unemployment

*frictions and rigidities*

Friedman, Milton (born 1912)

Friend, Irwin (born 1915)

Frisch, Ragnar Anton Kittel  
(1895–1973)*Frobenius theorem*

## full and limited information methods

Fullarton, John (1780?–1849)

## full communism

## full-cost pricing

## full employment

## full employment budget surplus

## functional analysis

## functional finance

## functions

## fundamental disequilibrium

## fungibility

Fuoco, Francesco (1774–1841)

## futures markets, hedging and speculation

## futures trading

## fuzzy sets

## gains from trade

Gaitskill, Hugh Todd Naylor

(1906–1963)

Galbraith, John Kenneth (born 1908)

Galiani, Ferdinando (1728–1787)

## games with incomplete information

## game theory

## gaming contracts

Ganilh, Charles (1785–1836)

Garnier, Clément Joseph (1813–1881)

## gauge functions

Gayer, Arthur David (1903–51)

## gearing

Geary, Robert Charles (1896–1983)

Gee, Joshua (*fl.* 1725–1750)

## gender

## general equilibria, computation of

## general equilibrium

## general equilibrium, existence of

## general systems theory

Genovesi, Antonio (1712–1769)

George, Henry (1839–1897)

Georgescu-Roegen, Nicholas (born  
1906)

## German historical school

Gerschenkron, Alexander (1904–1978)

Gervaise, Isacc (*fl.* 1680–1720)

Gesell, Silvio (1862–1930)

Giblin, Lyndhurst Falkiner (1872–1951)

Gibrat, Robert Pierre Louis (1904–1980)

## Gibrat's Law

Gide, Charles (1847–1932)

Giffen, Robert (1837–1910)

## Giffen's Paradox

## gifts

Gilbert, Milton (1909–1979)

Gilman, Charlotte Perkins (1860–1935)

Gini, Corrado (1884–1965)

## Gini ratio

Gioia, Melchiorre (1767–1829)

## global analysis

## global stability

## gluts

Godwin, William (1756–1836)

## golden age

## golden rule

Goldsmith, Raymond William (born  
1904)

Goldsmith, Selma (1912–1962)

## gold standard

Gonner, Edward Carter Kersey  
(1862–1922)

## goods and commodities

Gordon, Robert Aaron (1908–1978)

Goschen, George Joachim, Viscount  
(1831–1907)

Gossen, Hermann Heinrich (1810–58)

Gournay, Marquis de (1712–1759)

## government borrowing

## government budget restraint

## government ownership

## government regulation

Graham, Frank Dunstone (1890–1949)

Gramsci, Antonio (1891–1937)

## graph theory

Gras, Norman Scott Brien (1884–1956)

Graunt, John (1620–1674)

## gravitation

## gravity models

Gray, Alexander (1882–1968)

Gray, John (1799–1883)

Gray, Simon (alias George Purves,  
LLD) (*fl.* 1795–1840)Gregory, Theodore Emanuel Gugenheim  
(1890–1970)

Gresham, Thomas (c1519–1579)

## Gresham's Law

Grossmann, Henryk (1881–1950)

## gross revenue

## gross substitutes

Grotius (de Groot), Hugo (1583–1645)

## group decisions

## group (Lie group) theory

## Groves-Ledyard mechanism

## growth, immiserizing

## growth, measurement of

## growth accounting

## growth and cycles

## growth and inflation

## growth and international trade

## growth models, classical

## growth models, neoclassical

## growth theory

Haavelmo, Trygve (born 1911)

Habakkuk, John Hrothgar (born 1915)

Haberler, Gottfried (born 1900)

## habit persistence

Hadley, Arthur Twining (1856–1930)

Hagen, Everett Einar (born 1906)

## Hahn problem

Halévy, Elie (1870–1937)

Hamilton, Alexander (1755–1804)

Hamilton, Earl Jefferson (born 1899)

## hamiltonians

Hammar skjöld, Dag (1905–1961)

Hammond, John Lawrence le Breton  
(1872–1949) and Lucy Barbara  
(1873–1961)

Hansen, Alvin (1887–1975)

Hardenberg, Georg Friedrich Philipp von

Hardy, Charles Oscar (1884–1948)

## harmony

Harris, Seymour Edwin (1897–1975)

## Harris-Todaro model

Harrod, Roy Forbes (1900–1978)

## Harrod-Domar growth model

Hart, Albert Gailord (born 1909)

## Hawkins-Simon conditions

Hawtrey, Ralph George (1879–1975)

Hayek, Friedrich August von (born  
1899)

## Hayek effect

## health economics

Hearn, William Edward (1826–1888)

Heckscher, Eli Filip (1879–1952)

## Heckscher-Ohlin trade theory

## hedging

## hedonic functions and hedonic indexes

## hedonism

## Hegelianism

Heffnerich, Karl (1872–1924)

Heller, Walter Wolfgang (1915–1987)

Helvetius, Claude Adrien (1715–1771)

Henderson, Alexander (1914–1954)

Henderson, Hubert Douglas (1890–1952)

## heredity

## Herfindahl index

Hermann, Friedrich Benedict Wilhelm  
von (1795–1868)

Herskovits, Melville Jean (1895–1963)

## heterogeneous capital models

## heteroskedasticity

Hicks, John Richard (born 1904)

Hicks, Ursula Kathleen (1896–1985)

hidden actions, moral hazard and  
contract theory

## hidden hand

## hierarchy

## higgling

Higgs, Henry (1864–1940)

high-powered money and the monetary  
base

Hildebrand, Bruno (1812–1878)

Hilferding, Rudolf (1877–1941)

Hill, Polly (born 1914)

Hirschman, Albert Otto (born 1915)

## historical cost accounting

## historical demography

## historical school

## hoarding

Hobbes, Thomas (1588–1679)

Hobson, John Atkinson (1858–1940)

Hodgskin, Thomas (1787–1869)

Hollander, Jacob Harry (1871–1940)

Homan, Paul Thomas (1893–1969)

## homogeneous and homothetic functions

## homoskedasticity

Horner, Francis (1778–1817)

Hotelling, Harold (1895–1973)

## hot money

## hours of labour

## household budgets

## household production

## housework

## housing markets

## human capital

## human nature



- humbug production function  
 Hume, David (1711–1776)  
*hunger*  
 hunting and gathering economies  
 Huskisson, William (1770–1830)  
 Hutcheson, Francis (1694–1746)  
 Hutchison, Terence Wilmet (born 1912)  
 Hymer, Steven Herbert (1934–1974)  
 Hyndman, Henry Mayers (1842–1921)  
 hyperinflation  
 hypothesis testing  
 ideal indexes  
 ideal output  
 ideal-type  
 identification  
 ideology  
*immigration*  
 immiserizing growth  
 impatience  
 imperfect competition  
 imperfectionist models  
 imperialism  
 implicit contracts  
*import duties*  
 import substitution and export-led growth  
*impossibility theorem*  
*imprisonment*  
 imputation  
 incentive compatibility  
 incentive contracts  
*incidence of taxation*  
 income  
*income distribution*  
 income–expenditure analysis  
 incomes policies  
*income taxes*  
 incomplete contracts  
*incomplete information games*  
 incomplete markets  
 increasing returns  
*indentured labour*  
 indexed securities  
*indexing*  
 index numbers  
 indicative planning  
 indicators  
 indifference, law of  
*indifference curves*  
 indirect taxes  
 indirect utility function  
 individualism  
 indivisibilities  
 induction  
 industrialization  
 industrial organization  
*industrial partnership*  
 industrial relations  
 industrial revolution  
 inequalities  
 inequality  
 inequality between nations  
 inequality between persons  
 inequality between the sexes  
 inequality of pay  
 infant industry  
 infant mortality  
 inflation  
 inflation accounting  
 inflation and growth  
 inflationary expectations  
 inflationary gap  
 informal economy  
 information theory  
 Ingram, John Kells (1823–1907)  
 inheritance  
 inheritance taxes  
 Innis, Harold Adams (1894–1952)  
 innovation  
 input–output analysis  
 institutional economics  
 instrumental variables  
*instruments*  
 insurance, economics of  
 integer programming  
 integrability of demand  
 intelligence  
*intensive rent*  
 interdependent preferences  
 interest and profit  
 interest rates  
 interests  
 intergenerational models  
*inter-industry analysis*  
 internal economies  
 internal migration  
 internal rate of return  
 international capital flows  
 international finance  
 international income comparisons  
 international indebtedness  
*international inequality*  
 international liquidity  
 international migration  
 international monetary institutions  
 international monetary policy  
 international trade  
 interpersonal utility comparisons  
 intertemporal equilibrium and efficiency  
 intertemporal portfolio theory and asset pricing  
 invariable standard of value  
*invariance principles*  
 inventories  
 inventory cycles  
 inventory policies under certainty  
 investment  
 investment and accumulation  
 investment decision criteria  
 investment planning  
 invisible hand  
 involuntary unemployment  
 iron law of wages  
 IS–LM analysis  
 Isnard, Achille Nicolas (1749–1803)  
 Jaffé, William (1898–1980)  
 Jaszi, George (born 1915)  
 Jefferson, Thomas (1743–1826)  
 Jenkin, Henry Charles Fleeming (1833–1885)  
 Jennings, Richard (1814–1891)  
 Jevons, William Stanley (1835–1882)  
 Jevons as an economic theorist  
 Jewkes, John (born 1902)  
 Johannsen, Nicolas (1844–1928)  
 Johansen, Leif (1930–1982)  
 Johnson, Alvin Saunders (1874–1971)  
 Johnson, Harry Gordon (1923–1977)  
 Johnson, William Ernest (1858–1931)  
 joint production  
 joint production in linear models  
 Jones, George Thomas (1902–1929)  
 Jones, Richard (1790–1855)  
 Joplin, Thomas (c1790–1847)  
 Juglar, Clément (1819–1905)  
 jurisprudence  
 Justi, Johann Heinrich Gottlob von (1720–1771)  
 justice  
 just price  
 Kahn, Richard Ferdinand (born 1905)  
 Kaldor, Nicholas (1908–1986)  
 Kalecki, Michal (1899–1970)  
 Kantorovich, Leonid Vitalievich (1912–1986)  
*Kathedersozialisten*  
 Katona, George (1901–1981)  
 Kautsky, Karl (1854–1938)  
 Kelley, Augustus Maverick (born 1913)  
 Kemmerer, Edwin Walter (1875–1945)  
 Kendall, Maurice George (1907–1983)  
 Kessel, Reuben Aaron (1923–1975)  
 Keynes, John Maynard (1883–1946)  
 Keynes, John Neville (1852–1949)  
 Keynes's *General Theory*  
*Keynesian distribution theories*  
 Keynesianism  
 Keynesian Revolution  
 Keyserling, Leon Hirsch (born 1908)  
 Kindleberger, Charles Poor (born 1910)  
 King, Gregory (1648–1712)  
 kinked demand curve  
*kinship*  
 Kitchin, Joseph (1861–1932)  
 Knapp, Georg Friedrich (1842–1926)  
 Knies, Karl Gustav Adolf (1821–1898)  
*knife-edge problem*  
 Knight, Frank Hyneman (1885–1962)  
 Knights Templar  
 Kondratieff, Nikolai Dmitrievich (1892–?1931)  
 Kondratieff cycle  
 Konüs, A.A. (born 1895)  
 Koopmans, Tjalling Charles (1910–1985)  
 Koyck [Kojick], Leendert Marinus (1918–1962)  
 Kuczynski, Jurgen Peter (born 1904)  
 Kuh, Edwin (1925–1986)  
*Kuhn-Tucker theory*  
 Kuznets, Simon (1901–1985)  
 Kuznets swings  
*labour, abstract*  
*labour contracts*  
 labour economics  
 labour exchange  
 labour-managed economies  
 labour market discrimination

- labour markets  
labour power  
labour process  
labour supply of women  
labour surplus economies  
labour theory of value  
Lagrange multipliers  
laissez-faire, laissez-passer, history of the maxim  
land reform  
land rent  
Landry, Adolphe (1874-1956)  
land tax  
*land tenure*  
Lange, Oskar Ryszard (1904-1965)  
Lange-Lerner mechanism  
Lardner, Dionysius (1793-1859)  
large economies  
Laspeyres, Ernst Louis Etienne (1834-1913)  
Lassalle, Ferdinand (1825-1864)  
latent variables  
latifundia  
Lauderdale, Eighth Earl of (1759-1839)  
Laughlin, James Laurence (1850-1933)  
Launhardt, Carl Friedrich Wilhelm (1832-1918)  
Laveleye, Emile de (1822-1892)  
Lavington, Frederick (1881-1927)  
Law, John (1671-1729)  
law and economics  
*law enforcement*  
*law of indifference*  
*law of large numbers*  
*law of supply and demand*  
layoffs  
Layton, Walter Thomas (1884-1966)  
leads and lags  
learning-by-doing  
least squares  
Le Chatelier Principle  
Lederer, Emil (1882-1939)  
Lefebvre, Georges (1874-1959)  
Lehfeldt, Robert Alfred (1868-1927)  
leisure  
leisure class  
*Lemercier de la Rivière, Pierre Paul lemons*  
Lenin, Vladimir Ilyich [Ulyanov] (1870-1924)  
Leontief, Wassily (born 1906)  
Leontief paradox  
Lerner, Abba Ptachya (1905-1982)  
Leroy-Beaulieu, Pierre-Paul (1843-1916)  
*Leslie, T.E. Cliffe*  
Le Trosne, Guillaume François (1728-1780)  
Lewis, W. Arthur (born 1915)  
lexicographic orderings  
Lexis, Wilhelm (1837-1914)  
*liabilities*  
*Liapunov functions*  
liberalism  
liberty  
*libraries*  
Lieben, Richard (1842-1919)  
life cycle hypothesis  
life insurance  
life tables  
likelihood  
limited dependent variables  
*limited information methods*  
limit pricing  
limits to growth  
Lindahl, Erik Robert (1891-1960)  
Lindahl equilibrium  
Lindahl on public finance  
linear models  
linear programming  
linkages  
Lintner, John Virgil (1916-1983)  
liquidity  
liquidity preference  
List, Friedrich (1789-1846)  
Liu, Ta-Chung (1914-1975)  
Lloyd, William Forster (1794-1852)  
loanable funds  
local public finance  
*local stability*  
location of economic activity  
Locke, John (1632-1704)  
*logical positivism*  
logit, probit and tobit  
lognormal distribution  
long cycles  
Longe, Francis David (1831-18??)  
Longfield, Mountfort (1802-1884)  
long-run and short-run  
long swings in economic growth  
Lorenz curve  
Loria, Achille (1857-1943)  
Lösch, August (1906-1945)  
Lotka, Alfred James (1880-1949)  
*lotteries*  
Lowe, Adolph (born 1893)  
low pay  
*Loyd, Samuel Jones*  
lump sum taxes  
Lundberg, Erik Filip (born 1907)  
Lutz, Friedrich August (1901-1975)  
Luxemburg, Rosa (1870-1919)  
Lyapunov functions  
Lyapunov's theorem  
McCulloch, John Ramsay (1789-1864)  
Macfie, Alec Lawrence (1898-1980)  
machinery question  
Machlup, Fritz (1902-1983)  
Macleod, Henry Dunning (1821-1902)  
macroeconomic models  
macroeconomics: relations with microeconomics  
Mahalanobis, Prasanta Chandra (1893-1972)  
Maine, Henry James Sumner (1822-1888)  
maintaining capital intact  
*Maitland, James*  
*majority voting*  
Makower, Helen (born 1910)  
Malthus, Thomas Robert (1766-1834)  
Malthus and classical economics  
Malthus's theory of population  
Malynes, Gerard de (*fl.* 1586-1623)  
*management science*  
managerial capitalism  
Manchester School  
Mandeville, Bernard (1670-1733)  
Mangoldt, Hans von (1824-1868)  
Manoilescu, Mihail (1891-?1950)  
*manorial system*  
Mantoux, Paul (1877-1956)  
manufacturing and deindustrialization  
Mao Zedong [Mao Tse-Tung] (1893-1976)  
Marcet, Jane (1769-1858)  
Marchal, Jean (born 1905)  
Marczewski, Jean (born 1908)  
Marget, Arthur William (1899-1962)  
marginal and average cost pricing  
marginal efficiency of capital  
marginalist economics  
marginal productivity theory  
marginal utility of money  
*market clearing*  
market failure  
marketing boards  
market period  
market places  
market price  
*markets, financial*  
*markets, perfect and imperfect*  
market share  
market socialism  
market structure  
market structure and innovation  
market value and market price  
*Markov processes*  
*mark-up pricing*  
*marriage*  
Marschak, Jacob (1898-1977)  
Marshall Alfred (1842-1924)  
Marshall, Mary Paley (1850-1944)  
Marshall-Lerner condition  
Martin, Henry (died 1721)  
Martineau, Harriet (1802-1876)  
martingales  
Marx, Karl Heinrich (1818-1883)  
Marxian value analysis  
Marxism  
Marxist economics  
Mason, Edward Sagendorph (born 1899)  
Massé, Pierre (born 1898)  
Massie, Joseph (died 1794)  
material balances  
*materialism*  
mathematical economics  
mathematical method in political economy  
matrix multiplier  
maximum likelihood  
maximum satisfaction  
Mazzola, Ugo (1863-1899)  
Meade, James Edward (born 1907)  
meaningfulness and invariance  
Means, Gardiner Coit (born 1896)  
mean value

- mean-variance analysis  
 measurement, theory of  
 measurement of economic growth  
*measures of value*  
 measure theory  
*media of exchange*  
 mediation  
*medical care*  
 Meek, Ronald Lindley (1917-1978)  
 Menger, Anton (1841-1906)  
 Menger, Carl (1840-1921)  
 Menger, Karl (1902-1985)  
 mercantilism  
 Mercier de la Rivière, Pierre-Paul (1720-1793/4)  
 mergers  
 merit goods  
 Merivale, Herman (1806-1874)  
 Methodenstreit  
 methodology  
 Metzler, Lloyd Appleton (1913-1980)  
 Meynieu, Mary (died 1877)  
*microanalytic systems*  
 microeconomics  
*middle class*  
*migration, internal*  
*migratory labour*  
 militarism  
 military expenditure  
 Mill, James (1773-1836)  
 Mill, John Stuart (1806-1873)  
 Mill, John Stuart as economic theorist  
 Millar, John (1735-1801)  
*mines*  
 minimum wages  
 Mirabeau, Victor Riquetti, Marquis de (1715-1789)  
 Mises, Ludwig Edler von (1881-1973)  
 Misselden, Edward (fl. 1608-1654)  
 Mitchell, Wesley Clair (1874-1948)  
*mobility*  
 models and theory  
 models of growth  
 mode of production  
*Modigliani-Miller theorem*  
 Molinari, Gustave de (1819-1912)  
 monetarism  
 monetary approach to the balance of payments  
 monetary base  
 monetary cranks  
 monetary disequilibrium and market clearing  
 monetary equilibrium  
 monetary policy  
*monetary policy in developing countries*  
*money, fiat*  
*money, quantity theory of*  
 money and general equilibrium theory  
 money illusion  
 money in economic activity  
 moneylenders  
*money markets*  
 money supply  
*money wages*  
 monocentric models in urban economics  
 monopolistic competition  
 monopolistic competition and general equilibrium  
 monopoly  
*monopoly, degree of*  
 monopoly capitalism  
 monotone mappings  
 Montchrétien, Antoine de (1575-1621)  
 Monte Carlo methods  
 Moore, Henry Ludwell (1869-1958)  
 moral hazard  
 moral philosophy  
 Morgenstern, Oskar (1902-1977)  
 mortality  
 Müller, Adam Heinrich (1779-1829)  
 multicollinearity  
 multinational corporations  
 multiplier-accelerator interaction  
 multiplier analysis  
 multisector growth models  
 multivariate time series models  
 Mummery, Albert Frederick (1855-1895)  
 Mun, Thomas (1571-1641)  
*municipal housing*  
 Musgrave, Richard Abel (born 1910)  
 myopic decision rules  
 Myrdal, Gunnar (1898-1987)  
*NAIRU*  
 Nash equilibrium  
 Nathan, Robert Roy (born 1908)  
 national debt  
 national income  
 nationalism  
 nationalization  
*nationalization of land*  
*national security*  
 national system  
 natural and normal conditions  
 natural and warranted rates of growth  
*natural fertility*  
 natural law  
 natural monopoly  
*natural order*  
 natural price  
 natural rate and market rate  
 natural rate of unemployment  
 natural resources  
 natural selection and evolution  
 natural wage  
 necessities  
 Necker, Jacques (1732-1804)  
 Nef, John Ulric (born 1899)  
 negative income tax  
 negative quantities  
 Neisser, Hans Philipp (1895-1975)  
 Nemchinov, Vasily Sergeevich (1894-1964)  
 'neoclassical'  
*neoclassical economics*  
 neoclassical growth theory  
 neoclassical synthesis  
*neoclassical theory of distribution*  
*neoclassical theory of production*  
 neo-Ricardianism  
 net product  
 Neumann, Franz (1900-1954)  
*Neumann, John von*  
 neutrality of money  
 neutral taxation  
 new classical macroeconomics  
 Newcomb, Simon (1835-1909)  
 Newmarch, William (1820-1882)  
 Nicholls, William Hord (1914-1978)  
 Nicholson, Joseph Shield (1850-1927)  
*nominal quantities*  
*nominal wages*  
*non-basic commodities*  
 non-competing groups  
 non-convexity  
 non-cooperative games  
 non-linear methods in econometrics  
 non-linear programming  
 non-nested hypotheses  
 non-parametric statistical methods  
*non-pecuniary economies*  
 non-price competition  
 non-profit organizations  
*non-recontracting models*  
 non-standard analysis  
 non-substitution theorems  
*non-tradeable goods*  
*normal conditions*  
 North, Dudley (1641-1691)  
 North-South economic relations  
 Novalis (1772-1801)  
 Nove, Alexander (born 1915)  
 Novozhilov, Viktor Valentinovich (1892-1970)  
 numeraire  
 numerical determination of the laws of utility  
 Nurkse, Ragnar (1907-1959)  
 nutrition  
 O'Brien, George (1892-1973)  
 Occam's [Ockham's] razor  
 occupational segregation  
 offer  
 offer curve or reciprocal demand curve  
 Ohlin, Bertil Gotthard (1899-1979)  
 Okun, Arthur M (1928-1980)  
 oligopoly  
 oligopoly and game theory  
 Oncken, August (1844-1911)  
*open economy*  
 open field system  
 open-market operations  
*open systems*  
 operations research  
 ophelimity  
 Oppenheimer, Franz (1864-1943)  
 opportunity cost  
 optimal control and economic dynamics  
*optimal growth*  
 optimality and efficiency  
 optimal savings  
 optimal tariffs  
 optimal taxation  
 optimism and pessimism  
 optimum currency areas  
 optimum population  
 optimum quantity of money  
 option pricing theory

- options  
 orderings  
 Oresme, Nicholas (1325-1382)  
 organic composition of capital  
 organization theory  
 Ortes, Giammaria (1713-1790)  
 outliers  
 output and employment  
*overaccumulation*  
 overhead costs  
 overinvestment  
 overlapping generations model of general equilibrium  
 overproduction  
 oversaving  
 overshooting  
 Overstone, Lord [Samuel Jones Loyd] (1796-1883)  
 Owen, Robert (1771-1858)  
 own rates of interest  
 Palander, Tord Folkesson (1902-1972)  
*Paley, Mary*  
 Paley, William (1743-1805)  
 Palgrave, Robert Harry Inglis (1827-1919)  
*Palgrave's Dictionary of Political Economy*  
 Palmer, John Horsley (1779-1858)  
 Pantaleoni, Maffeo (1857-1924)  
*paper money*  
 Papi, Giuseppe Ugo (born 1893)  
 paradigm  
 paradoxes and anomalies  
*paradoxes in capital theory*  
*paradox of voting*  
 Pareto, Vilfredo (1848-1923)  
 Pareto as an economist  
 Pareto distribution  
 Pareto efficiency  
*Pareto optimality*  
 Parnell, Henry Brooke (1776-1842)  
 Parsons, Talcott (1902-1979)  
*partial equilibrium*  
 Pascal, Blaise (1623-1662)  
 patents  
 path analysis  
 Patten, Simon Nelson (1852-1922)  
 pay-off period  
 payroll taxes  
 peak-load pricing  
 peasant economy  
 peasants  
 pecuniary and non-pecuniary economies  
 Pennington, James (1777-1862)  
 Penrose, Edith Tilton (born 1914)  
 perfect competition  
 perfect foresight  
 perfect information  
 perfectly and imperfectly competitive markets  
 performing arts  
 period of production  
 periphery  
 Perlman, Selig (1888-1959)  
*permanent income hypothesis*  
 Perron-Frobenius theorem  
 Perroux, François (1903-1987)  
 Persons, Warren Milton (1878-1937)  
 Pesch, Heinrich (1854-1926)  
 Peter, Hans (1898-1959)  
 Petty, William (1623-1687)  
 Phelps Brown, (Ernest) Henry (born 1906)  
 Philippovich von Philippsberg, Eugen (1858-1917)  
 Phillips, Alban William Housego (1914-1975)  
 Phillips curve  
*philosophic radicalism*  
 philosophy and economics  
 Physiocrats  
 Pierson, Nicolaas Gerard (1839-1909)  
 Pigou, Arthur Cecil (1877-1959)  
*Pigou effect*  
 Pirou, Gaetan (1886-1946)  
 Place, Francis (1771-1854)  
 planned economy  
 planning  
 Plant, Arnold (1898-1978)  
 plantations  
 Playfair, William (1759-1823)  
 pleasure and pain  
 Plekhanov, Georgii Valentinovich (1856-1918)  
 plutology  
 Polak, Jacques Jacobus (born 1914)  
 Polanyi, Karl (1886-1964)  
 poles of development  
 political arithmetic  
 political business cycle  
 'political economy' and 'economics'  
 political economy and psychology  
 politics and economics  
*poll taxes*  
 Pontryagin's principle of optimality  
 Poor Law  
*population*  
*population, optimum*  
 population cycles  
 portfolio analysis  
 positive economics  
 positivism  
*possibility theorem*  
 Postan, Michael Moïsey (1899-1981)  
 post-Keynesian economics  
 Postlethwayt, Malachy (1707?-1767)  
 poverty  
 Power, Eileen Edna (1889-1940)  
 Pownall, Thomas (1722-1805)  
 Prebisch, Raul (1901-1985)  
*Prebisch-Singer hypothesis*  
 predator-prey models  
 predatory pricing  
 prediction  
 preference reversals  
 preferences  
 Preobrazhensky, Evgenii Alexeyevich (1886-1937)  
 preordering  
 present value  
 present value of the past  
 Price, Langford Lovell Frederick Rice (1862-1950)  
 price control  
 price discrimination  
*price index*  
 price level  
 prices and quantities  
 prices of production  
 primary and secondary labour markets  
 primitive capitalist accumulation  
*primogeniture*  
 principal and agent (i)  
 principal and agent (ii)  
 principal components  
 prisoner's dilemma  
*private property*  
 privatization  
 probability  
*probits*  
 producers' markets  
 product cycle  
 product differentiation  
 production: classical theories  
*production, modes of*  
 production: neoclassical theories  
*production, prices of*  
 production and cost functions  
 production as indirect exchange  
 production functions  
 productive and unproductive consumption  
 productive and unproductive labour  
 productivity: measurement problems  
*produit net*  
*profit, equal rates of*  
 profit and profit theory  
*profit-sharing*  
 profit taxes  
 progressive and regressive taxation  
 project evaluation  
*proletariat*  
 propensity to consume  
 property  
 property rights  
 property taxation  
*proportional taxation*  
 protection  
*protestant ethic*  
 Proudhon, Pierre Joseph (1809-1865)  
 pseudo-distribution  
 psychology and economics  
 public choice  
 public debt  
 public economics  
 public finance  
 public goods  
 public health  
*public policy*  
 public sector borrowing  
 public utility pricing  
 public works  
 Pufendorf, Samuel von (1632-1694)  
*Puller, Richard*  
 pump priming  
 punishment  
*purchasing power of money*

- purchasing power parity  
*puritanism*  
*Purves, George*  
*put and call*  
 qualitative economics  
 quantity of capital  
 quantity theory of money  
 quasi-concavity  
 quasi-contract  
*quasi-rent*  
 Quesnay, François (1694-1774)  
 queueing theory  
 quotas and tariffs  
 race and economics  
 radical political economy  
 Rae, John (1796-1872)  
 Rae, John (1845-1915)  
 Ramsey, Frank Plumpton (1903-1930)  
 Ramsey model  
 Ramsey pricing  
 random coefficients  
 randomization  
 random variables  
 rank  
*rankings*  
*rank-order methods*  
 rate of exploitation  
 rational behaviour  
 rational expectations  
 rational expectations: econometric implications  
 rationalization of industry  
 rationed equilibria  
 rationing  
 Rau, Karl Heinrich (1792-1870)  
 Ravenstone, Percy  
 Raymond, Daniel (1786-1849)  
 Read, Samuel (fl. 1816-29)  
 real and nominal quantities  
 real balances  
 real bills doctrine  
 real cost doctrine  
 real income  
 realization problem  
*real wages*  
*reciprocal demand*  
*recontracting*  
*recoupment period*  
 recreation  
 Reddaway, William Brian (born 1913)  
 redistribution of income and wealth  
*reforestation*  
 regional development  
 regional distribution of economic activity  
 regional economics  
 regression and correlation analysis  
*regressive taxation*  
 regular economies  
*régulation*  
 regulation and deregulation  
 Reid, Margaret Gilpin (born 1896)  
 relative income hypothesis  
 relativity, principle of, in political economy  
 renewable resources  
 rent  
 rent control  
 rentier  
 rent seeking  
 reparations  
 repeated games  
 replacement policy  
 representation of preferences  
*representative firm*  
 reservation price and reservation demand  
*reserve army*  
*reserves, free*  
*reserves, international*  
 residuals  
*residual share*  
*resource allocation*  
 reswitching of technique  
*retaliation*  
 retention ratio  
 returns to scale  
 revealed preference theory  
 revelation of preferences  
 revenue, gross and net  
 reverse capital deepening  
 rhetoric  
 Ricardian equivalence theorem  
 Ricardian Socialists  
 Ricardo, David (1772-1823)  
 Ricardo-Hayek effect  
 Ricci, Umberto (1879-1946)  
 rising supply price  
 risk  
 Rist, Charles (1874-1955)  
 Robbins, Lionel Charles (1898-1984)  
 Robertson, Dennis (1890-1963)  
 Robinson, Abraham (1918-1974)  
 Robinson, Edward Austin Gossage (born 1897)  
 Robinson, Joan Violet (1903-1983)  
 Robinson Crusoe  
 Rodbertus, Johann Karl (1805-1875)  
 Rogers, James Edwin Thorold (1823-1890)  
 Roos, Charles Frederick (1901-1958)  
 Röpke, Wilhelm (1899-1966)  
 Roscher, Wilhelm Georg Friedrich (1817-1894)  
 Rosenstein-Rodan, Paul Narcyz (1902-1985)  
 Rossi, Pellegrino Luigi Edoardo (1787-1848)  
 Rostas, Laslo (1909-1954)  
 Rothbarth, Erwin (1913-1944)  
 Rothschild, Kurt Wilhelm (born 1914)  
 roundabout methods of production  
 Rousseau, Jean Jacques (1712-1778)  
 Roy, René François Joseph (1894-1977)  
 Royal Economic Society  
 Rueff, Jacques (1896-1978)  
*rural economy*  
 Ruskin, John (1819-1900)  
 Ryazanov, David  
*Rybczynski theorem*  
 saddlepoints  
*St Petersburg paradox*  
 Saint-Simon, Claude-Henri de Rouvroy (1760-1825)  
 Salin, Edgar (1892-1974)  
 Salter, Wilfred Edward Graham (1929-1963)  
 Samuelson, Paul Anthony (born 1915)  
*sanctions*  
 Sanger, Charles Percy (1871-1930)  
 satellite models  
*satiation*  
 satisficing  
 Sauvy, Alfred (born 1898)  
 Savage, Leonard J. (Jimmie) (1917-1971)  
*saving*  
 saving equals investment  
 Sax, Emil (1845-1927)  
 Say, Horace Emile (1794-1860)  
 Say, Jean-Baptiste (1767-1832)  
 Say's Law  
 Say, (Jean-Baptiste) Léon (1826-1896)  
 Say, Louis Auguste (1774-1840)  
 Sayers, Richard Sidney (born 1908)  
 scarcity  
 Schacht, Horace Greeley Hjalmar (1877-1970)  
 Schäffle, Albert Eberhard Friedrich (1831-1903)  
 Schlesinger Karl (1889-1938)  
 Schmoller, Gustav von (1838-1917)  
 Schmookler, Jacob (1918-1967)  
 Schneider, Erich (1900-70)  
 scholastic economic thought  
*schoolmen*  
 Schultz, Henry (1893-1938)  
 Schultz, Theodore Wilhain (born 1902)  
 Schumacher, E. F. (Fritz) (1911-1977)  
 Schumpeter, Joseph Alois (1883-1950)  
 Schwartz, Anna Jacobson (born 1915)  
 Schwartz, Nancy Lou (1939-1981)  
*scientific management*  
 Scitovsky, Tibor (born 1910)  
 Scott, William Robert (1868-1940)  
 Scottish Enlightenment  
 Scrope, George Poulett (1797-1876)  
 search theory  
 seasonal variation  
 second best  
 Secrétan, Charles (1815-1895)  
*security, national*  
*security, social*  
 Seers, Dudley (1920-1983)  
 segmented labour markets  
 seignorage  
 selection bias and self-selection  
 self-interest  
 Seligman, Edwin Robert Anderson (1861-1939)  
 selling costs  
 semiparametric estimation  
 Senior, Nassau William (1790-1864)  
 separability  
 sequence economies  
 sequential analysis  
*serfdom*  
 Serra, Antonio (fl. 1613)  
 services

*settlement*

Shackle, George Lennox Sharman (born 1903)

## shadow pricing

## Shapley–Folkman theorem

## Shapley value

## sharecropping

*share economy*

Shaw, George Bernard (1856–1950)

Shephard, Ronald William (1912–1982)

Shibata, Kei (1902–1986)

Shonfield, Andrew Akiba (1917–79)

*short run*

Shoup, Carl Sumner (born 1902)

Shove, Gerald Frank (1888–1947)

Sidgwick, Henry (1838–1900)

Sidrauski, Miguel (1939–1968)

*Sieher, N.I.*

## signalling

Simmel, Georg (1858–1918)

Simons, Henry Calvert (1899–1946)

## simple and extended reproduction

## simplex method for solving linear programs

## simulation models

## simulation of microanalytic systems

## simultaneous equations models

## single tax

Sismondi, Jean Charles Leonard

Simonde de (1773–1842)

## slavery

Slichter, Sumner Huber (1892–1959)

*slump*

Slutsky, Eugen (1880–1948)

Smart, William (1853–1915)

Smith, Adam (1723–1790)

Smithies, Arthur (1907–1981)

## smuggling

Snyder, Carl (1869–1943)

## social accounting

## social choice

*social contract*

## social cost

## social democracy

## socialism

## socialist economics

## socialists of the chair

## socially necessary technique

## social security

## social welfare function

Sohmen, Egon (1930–1977)

## solidarity

Sombart, Werner (1863–1941)

Sonnenfels, Joseph von (1733–1817)

## sound money

Spann, Othmar (1878–1950)

## spatial competition

## spatial economics

## specie-flow mechanism

## specification problems in econometrics

## spectral analysis

Spencer, Herbert (1820–1903)

Spengler, Joseph John (born 1902)

Spiegel, Henry (born 1911)

Spiethoff, Arthur August Kaspar (1873–1957)

## spline functions

## sports

## spot and forward markets

## spurious regression

Sraffa, Piero (1898–1983)

## Sraffian economics

## stability

## stabilization policy

## stable population theory

Stackelberg, Heinrich von (1905–1946)

Stachle, Hans (1903–1961)

## stagflation

## stagnation

Stalin, Josif Vissarionovich (1879–1953)

Stamp, Josiah Charles (1880–1941)

## standard commodity

*state*

## state-dependent preferences

## state preference approach

## state provision of medical services

## stationary state

## stationary time series

## statistical decision theory

## statistical inference

Steindl, Josef (born 1912)

Stephen, Leslie (1832–1904)

Steuart, Sir James (1713–1780)

Stewart, Dugald (1753–1828)

Stigler, George Joseph (born 1911)

Stirner, Max (1806–1856)

## stochastic dominance

*stochastic models*

## stochastic optimal control

*stochastic processes*

## Stockholm school

## stocks and flows

*Stolper–Samuelson theorem*

Stone, John Richard Nicholas (born 1913)

Storch, Heinrich Friedrich von (1766–1835)

Strachey, John (1901–1963)

## strategic behaviour and market structure

## strategic reallocations of endowments

## strategy-proof allocation mechanisms

Strigl, Richard von (1891–1942)

## strikes

## structural change

## structural economic dynamics

## structuralism

## structural unemployment

Strumilin, Stanislav Gustavovich (1877–1974)

Struve, Pyotr Bergardovich (1870–1944)

## stylized facts

## subadditivity

## subjective probability

*subsidies*

## subsistence

## substitutes and complements

Sumner, William Graham (1840–1910)

## sunspot equilibrium

## supergames

*super neutrality*

## 'supply and demand'

*supply curves*

## supply functions

## supply shocks in macroeconomics

## surplus approach to value and distribution

## surplus value

## survey research

*survival*

Svennilson, Ingvar (1908–1972)

*Swedish school*

Sweezy, Paul Malor (born 1910)

Swift, Jonathan (1667–1745)

*tabular standard*

Tarbell, Ida Minerva (1857–1944)

## targets and instruments

## tariffs

Tarshis, Lorie (born 1911)

*tastes, changes in*

## tâtonnement and recontracting

Taussig, Frank William (1859–1940)

Tawney, Richard Henry (1880–1962)

*taxation*

## taxation of capital

## taxation of corporate profits

## taxation of income

## taxation of wealth

*taxes*

## taxes and subsidies

## tax incidence

Taylor, Fred Manville (1855–1932)

Taylor, Harriet (1807–1858)

## Taylorism

## teams

## technical change

*technique, choice of technological unemployment*

## temporary equilibrium

## terms of trade

## terms of trade and economic development

## term structure of interest rates

Thompson, Thomas Perronet (1783–1869)

Thompson, William (1785–1833)

Thornton, Henry (1760–1815)

Thornton, William Thomas (1813–1880)

Thünen, Johann Heinrich von (1783–1850)

Tiebout, Charles Mills (1924–1968)

## Tiebout hypothesis

## tight money

## time preference

## time series analysis

Tinbergen, Jan (born 1903)

Tintner, Gerhard (1907–1983)

Titmuss, Richard Morris (1907–1973)

*tobits*

Tocqueville, Alexis Charles Henri Clérel de (1805–1859)

Tooke, Thomas (1774–1858)

Torrens, Robert (1780–1864)

## total factor productivity

*town planning*

Townshend, Hugh (1890–1974)

Toynbee, Arnold (1852–1883)

Tozer, John Edward (1806–1877)

- trade*  
*trade, gains from*  
 tradeable and non-tradeable commodities  
 trade cycle  
 trade subsidies  
 trade unions  
 transactions costs  
 transfer of technology  
 transfer payments  
 transfer pricing  
 transfer problem  
 transformation of statistical variables  
 transformation of variables in econometrics  
 transformation problem  
 transformations and invariance  
 transformations in economics  
 transitivity  
 transport  
 Triffin, Robert (born 1911)  
*Trosne, Guillaume Francoise le*  
 Trotsky, Lev Davidovitch (1879 1940)  
*trusts*  
 Tsuru, Shigeto (born 1912)  
 Tucker, George (1775 1861)  
 Tucker, Josiah (1713 1799)  
 Tugan-Baranovsky, Mikhail Ivanovich (1865 1919)  
 Tugwell, Rexford Guy (1891 1979)  
 tulipmania  
 Turgot, Anne Robert Jacques, Baron de L'Aulne (1727 1781)  
 turnpike theory  
 Twiss, Travers (1809 1897)  
 two-sector models  
 two-stage least squares and the *k*-class estimator  
*unbiased technological change*  
 uncertainty  
 uncertainty and general equilibrium  
 underconsumption  
 undertaker  
 unemployment  
 unemployment benefit  
 unequal exchange  
 uneven development  
 unintended consequences  
 uniqueness of equilibrium  
*universalist economics*  
 Uno, Kozo (1897 1977)  
 unproductive consumption  
 unproductive labour  
 urban economics  
 urban housing  
 Ure, Andrew (1778 1857)  
 user cost  
 user fees  
 Usher, Abbot Payson (1884 1965)  
 usury  
 utilitarianism  
 utility  
 utility, degree of  
 utility, interpersonal comparison of  
*utility maximization*  
 utility theory and decision-making  
 utopias  
 Valeriani, Luigi Molinari (1758 1828)  
 value-added tax  
 value analysis  
 value and price  
 value judgements  
 value of life  
 value of time  
 Vanderlint, Jacob (died 1740)  
 Vansittart, Nicholas (1766 1851)  
 Varga, Evgeny (Jenő) (1879 1964)  
*variable capital*  
 Veblen, Thorstein (1857 1929)  
 Vecchio, Gustavo del (1883 1972)  
*veil of money*  
 velocity of circulation  
 vent for surplus  
 Verdoorn's Law  
 Vernon, Raymond (born 1913)  
 Verri, Pietro (1728 1797)  
 vertical integration  
 Vickrey, William Spencer (born 1914)  
 Viner, Jacob (1892 1970)  
 vintages  
 Viti de Marco, Antonio de (1858 1943)  
 Volterra, Vito (1860 1940)  
*von Böhm-Bawerk, Eugen*  
*von Hayek, Friedrich*  
*von Mises, Ludwig*  
 Von Neumann, John (1903 1957)  
*Von Neumann-Morgenstern utility function*  
 Von Neumann ray  
 Von Neumann technology  
*von Thünen, Johann Heinrich*  
 voting  
 Voznesensky, Nikolai Alekseevich (1903 1950)  
 vulgar economy  
 wage flexibility  
 wage fund doctrine  
 wage goods  
 wage indexation  
 wage labour  
 wages, iron law of  
 wages, real and money  
 wages in classical economics  
 Wagner, Adolph Heinrich Gotthelf (1835 1917)  
 waiting  
 Wakefield, Edward Gibbon (1796 1862)  
 Wald, Abraham (1902 1950)  
 Walker, Francis Amasa (1840 1897)  
 Wallace, Alfred Russel (1823 1913)  
 Wallich, Henry Christopher (born 1914)  
 Walras, Antoine Auguste (1801 1866)  
 Walras, Léon (1834 1910)  
 Walras's Law  
 Walras's theory of capital  
 wants  
 Warburton, Clark (1896 1979)  
 Ward, Barbara (1914 81)  
 war economy  
 Warming, Jens (1873 1939)  
 warranted growth  
 warranted rates of growth  
 warrants  
 waste products  
 water resources  
 wealth  
 wealth constraint  
 wealth effect  
 wealth taxes  
 Webb, Beatrice (1858 1943) and Sidney (1859 1947)  
 Weber, Alfred (1868 1958)  
 Weber, Max (1864 1920)  
 weighted least squares  
 Weintraub, Sidney (1914 1983)  
 welfare economics  
 welfare state  
 Wells, David Ames (1828 1898)  
 West, Edward (1782 1828)  
 Westergaard, Harald Ludvig (1853 1936)  
 Whately, Richard (1787 1863)  
 Wheatley, John (1772 1830)  
 Whewell, William (1799 1866)  
 Wicksell, Johan Gustav Knut (1851 1926)  
 Wicksell and neoclassical economics  
 Wicksell effects  
 Wicksell's theory of capital  
 Wicksteed, Philip Henry (1844 1927)  
 widow's cruse  
 Wiener process  
 Wieser, Friedrich Freiherr (Baron) von (1851 1926)  
 Williams, John Henry (1887 1980)  
 Wilson, Edwin Bidwell (1879 1964)  
 Wilson, James (1805 1860)  
 Wilson, Thomas (1525 1581)  
 windfalls  
 Withers, Hartley (1867 1950)  
 Witte, Edwin Emil (1887 1960)  
 Wold, Herman O.A. (born 1908)  
 women and work  
 women's wages  
 Wood, Stuart (1853 1914)  
 worker managed economies  
 Woytinsky, Wladimir Savelievich (1885 1960)  
 X-efficiency  
 Xenophon (c430 BC c355 BC)  
 Yntema, Theodore O. (1900 1985)  
 Young, Allyn Abbott (1876 1929)  
 Young, Arthur (1741 1820)  
 Zawadzki, Wladyslaw Marian (1885 1939)  
 zero-profit condition  
 zero-sum games  
 Zeuthen, Frederik Ludvig Bang (1888 1959)  
 Ziber, Nikolai Ivanovich (1844 1888)  
 zoning

## Contents

List of Entries A–Z	vii
The Dictionary, Volume 4	1
Appendix I	
Entries in <i>The New Palgrave</i> , by author	947
Appendix II	
Biographies from <i>Palgrave's Dictionary</i>	964
Appendix III	
Entries in <i>Palgrave's Dictionary of Political Economy</i> , by author	970
Appendix IV	
Subject Index	980
Index	989



# Q

**qualitative economics.** Qualitative economics comprises the analysis of economic systems for which qualitative information is available, that is, information about the direction of change (+, -, 0) of the values of the functional relations defining the system with respect to changes in the values of its variables. A distinction can be drawn between *purely* qualitative systems, namely, systems in which the only information available is such sign information, and mixed quantitative-qualitative systems which have quantitative information available as well.

Two classes of economic models have been the subject for most of the work done in qualitative economics: comparative statics models of the form  $Ax=b$ , and linear dynamic models of the form  $\dot{x}=Ax$ , where  $A$  is an  $n \times n$  matrix, and  $x$  and  $b$  are  $n \times 1$  vectors. In the comparative statics models, the problem is to sign (+, -, 0) the elements of the vector  $x$ , given information about the sign pattern of the matrix  $A$  and of the vector  $b$ . In the dynamic models, the problem is that of determining when there is asymptotic stability

$$\left( \lim_{t \rightarrow \infty} x(t) = 0 \right),$$

given information about the sign pattern of the matrix  $A$ .

Rather complete results are known in the case of purely qualitative systems, while there are a number of special results for mixed systems. Literature surveys covering the former appear in Maybee and Quirk (1969), Allingham and Morishima (1973), and Maybee (1981), while Quirk (1981) presents a summary of stability results for both pure and mixed systems.

Qualitative hypotheses have been a part of economics from the earliest days of formal economic analysis, but it was only in the late 1930s that the first attempts were made to formalize the analysis of qualitative information in economic models, beginning with Hicks's (1939) model of general equilibrium of a competitive economy. In *Foundations of Economic Analysis*, Samuelson (1947) identified qualitative information, the maximization hypothesis, and the hypothesis of stability of equilibrium as the three fundamental sources of comparative statics theorems in neoclassical economics. Metzler (1945), Mosak (1944), and Morishima (1952) made basic contributions to the analysis of the comparative statics properties of the Hicksian model, and Arrow, Block and Hurwicz (1958, 1959) and McKenzie (1960) provided proofs of stability of the Hicksian model under the gross substitute case, a mixed quantitative-qualitative system.

In the *Foundations*, Samuelson suggested an elimination approach to analysing qualitative solvability, but the first formal work on the comparative statics properties of purely qualitative systems was due to Lancaster (1962, 1964, 1965), whose approach was generalized by Gorman (1964). The Gorman approach to the qualitative solvability problem is an iterative one, involving a nesting procedure whereby at any stage in the analysis the set of variables is partitioned into two disjoint non-empty sets. For the functional relation associated with that stage, the direction of change of its value with

respect to the variables is weakly the same for all variables in a given set, and opposite to that for the variables in the other set. There is qualitative solvability if and only if this nested partitioning can be continued, exhausting all functional relations, until one element sets are reached.

Taking a different approach, Bassett, Maybee and Quirk (BMQ) (1968) provided the first proof of necessary and sufficient conditions for qualitative solvability of the comparative statics system  $Ax=b$ . The BMQ conditions use the notions of cycles and chains in matrices. A chain of length  $m$  from  $i$  to  $j$  ( $i \neq j$ ) in an  $n \times n$  matrix  $A$  is a product of  $m$  elements of  $A$ , with the first term in the chain having a row index  $i$  and the last term a column index  $j$ , with the row index of any term in the product the same as the column index in the preceding term in the product, and with all row indices differing from one another. A cycle (of length  $m+1$ ) is obtained by multiplying such a chain by the element  $a_{ji}$ .

The system  $Ax=b$  is said to be qualitatively solvable if, given information as to the signs (+, -, 0) of the elements of  $A$  and  $b$ , one can solve for a unique sign pattern for the vector  $x$ . In analysing such a system, admissible qualitative operations are restricted to renumbering individual equations and/or variables, and multiplying individual equations and/or variables by  $-1$ . The BMQ conditions state that  $Ax=b$  is qualitatively solvable if and only if by admissible qualitative operations the system can be put into the form  $Cy=d$ , where all diagonal elements in  $C$  are negative and all cycles in  $C$  are non-positive, while all the elements in  $d$  are non-negative. If the  $j$ th element in  $d$  is strictly positive, then all chains in  $C$  terminating in  $j$  must be non-negative. The solution vector  $y$  then has all elements non-positive.

Work on qualitative solvability in more recent years has been concerned primarily with the construction of efficient algorithms for testing for qualitative solvability (see Greenberg and Maybee, 1981; Lady, 1983; Ritschard, 1983), much of this utilizing the tools of graph theory. In addition some work has been done on the problem of partial qualitative solvability, that is, solving for the signs of one or more components of the vector  $x$  given sign information as to  $A$  and  $b$ . The problem of partial qualitative solvability has been resolved for the case where  $A$  is qualitatively non-singular but the problem has not been solved in general (see Quirk, 1972; Maybee, 1981; Lady, 1983).

In the purely qualitative case, analysis of the stability properties of the system  $\dot{x}=Ax$  has been concerned with the derivation of conditions such that the matrix  $A$  can be judged a stable matrix (i.e. the real parts of its characteristic roots are all negative), simply from information as to the sign pattern of  $A$ . When every matrix with the same sign pattern as  $A$  is a stable matrix, then  $A$  is said to be a sign stable matrix, and the dynamic system  $\dot{x}=Bx$  is asymptotically stable for any matrix  $B$  with the same sign pattern as  $A$ . In Quirk and Ruppert (QR) (1965), necessary and sufficient conditions for  $A$  to be a sign stable matrix were derived for the case where all the diagonal elements of  $A$  are negative. In this case, sign stability occurs if