

THE ECONOMICS OF INNOVATION

Critical Concepts in Economics

Edited by
Cristiano Antonelli

Volume I
Innovation and Growth:
The Classical Legacies

Routledge

Taylor & Francis Group

LONDON AND NEW YORK

THE ECONOMICS OF INNOVATION

Critical Concepts in Economics

Edited by
Cristiano Antonelli

Volume II
Innovation and Competition:
The Schumpeterian Legacy

6

|| Routledge

|| Taylor & Francis Group

LONDON AND NEW YORK

THE ECONOMICS OF INNOVATION

Critical Concepts in Economics

Edited by
Cristiano Antonelli

Volume III
Innovation and Knowledge:
The Arrovian Legacy

Routledge

Taylor & Francis Group

LONDON AND NEW YORK

THE ECONOMICS OF INNOVATION

Critical Concepts in Economics

Edited by
Cristiano Antonelli

Volume IV
Innovation and Complexity:
The Marshallian Legacy

11 Routledge

Taylor & Francis Group

LONDON AND NEW YORK



CONTENTS

<i>Acknowledgements</i>	xiii
<i>Chronological table of reprinted articles and chapters</i>	xv
General Introduction	1

VOLUME I INNOVATION AND GROWTH: THE CLASSICAL LEGACIES

1 Technical change and the aggregate production function ROBERT M. SOLOW	43
2 Adam Smith on the division of labour: two views or one? NATHAN ROSENBERG	58
3 The level of inventive activity JACOB SCHMOOKLER	73
4 Economic experiments NATHAN ROSENBERG	87
5 The direction of technological change: inducement mechanisms and focusing devices NATHAN ROSENBERG	109
6 Two propositions in the theory of induced innovations WILLIAM FELLNER	133
7 Induced technical change: evolution of thought HANS P. BINSWANGER	138
8 Why do new technologies complement skills? Directed technical change and wage inequality DARON ACEMOGLU	170

CONTENTS

9	A new view of technological change ANTHONY B. ATKINSON AND JOSEPH E. STIGLITZ	202
10	The origins of endogenous growth PAUL M. ROMER	208
11	A model of growth through creative destruction PHILIPPE AGHION AND PETER HOWITT	229
12	Growth theory from an evolutionary perspective: the differential productivity puzzle RICHARD R. NELSON AND SIDNEY G. WINTER	262
13	General purpose technologies: 'engines of growth'? TIMOTHY F. BRESNAHAN AND M. TRAJTENBERG	271
14	What requires explanation? RICHARD G. LIPSEY, CLIFF BEKAR AND KENNETH CARLAW	297
15	The dynamo and the computer: an historical perspective on the modern productivity paradox PAUL A. DAVID	334

VOLUME II INNOVATION AND COMPETITION: THE SCHUMPETERIAN LEGACY

	<i>Acknowledgements</i> •	vii
16	Innovation in large and small firms: an empirical analysis ZOLTAN J. ACS AND DAVID B. AUDRETSCH	1
17	Entrepreneurial enterprises, large established firms and other components of the free-market growth machine WILLIAM J. BAUMOL	20
18	The simple economics of basic scientific research RICHARD R. NELSON	39
19	A statistical analysis of corporate technological leadership historically JOHN CANTWELL AND BIRGITTE ANDERSEN	51

CONTENTS

20	Appropriation of returns from technological assets and the values of patents and R&D in Japanese high-tech firms	82
	SHOKO HANEDA AND HIROYUKI ODAGIRI	
21	Research and development resource allocation under rivalry	100
	F. M. SCHERER	
22	Industrial structure and the nature of innovative activity	133
	PARTHA DASGUPTA AND JOSEPH STIGLITZ	
23	The role of supply factors in the diffusion of new process technology	166
	P. STONEMAN AND N. J. IRELAND	
24	Investment and adoption in advanced telecommunications	181
	CRISTIANO ANTONELLI	
25	Technology adoption in the presence of network externalities •	203
	MICHAEL L. KATZ AND CARL SHAPIRO	
26	Diffusion as a process of creative adoption	223
	CRISTIANO ANTONELLI	
27	Sectoral patterns of technical change: towards a taxonomy and a theory	247
	KEITH PAVITT	
28	Schumpeterian patterns of innovation	294
	FRANCO MALERBA AND LUIGI ORSENIGO	
29	Innovation: mapping the winds of creative destruction	317
	WILLIAM J. ABERNATHY AND KIM B. CLARK	
30	Architectural innovation: the reconfiguration of existing product technologies and the failure of established firms	346
	REBECCA M. HENDERSON AND KIM B. CLARK	

VOLUME III INNOVATION AND KNOWLEDGE: THE ARROVIAN LEGACY

Acknowledgements . ix

31	Karl Marx on the economic role of science	1
	NATHAN ROSENBERG	

CONTENTS

32	Economic welfare and the allocation of resources for invention KENNETH J. ARROW	18
33	Toward a new economics of science PARTHA DASGUPTA AND PAUL A. DAVID	33
34	Patents and R&D at the firm level: a first report ARIEL PAKES AND ZVI GRILICHES	87
35	Innovativity: a comparison across seven European countries PIERRE MOHNEN, JACQUES MAIRESSE AND MARCEL DAGENAIS	92
36	Technological opportunity and spillovers of <i>R&D</i> : evidence from firms' patents, profits, and market value ADAM B. JAFFE	125
37	The search for R&D spillovers, , ZVI GRILICHES	152
38	The new economics of innovation, spillovers and agglomeration: a review of empirical studies MARYANN P. FELDMAN	171
39	Learning by firms and incremental technical change FRANCO MALERBA	192
40	Classificatory notes on the production and transmission of technological knowledge KENNETH J. ARROW	212
41	Imitation costs and patents: an empirical study EDWIN MANSFIELD, MARK SCHWARTZ AND SAMUEL WAGNER	221
42	Absorptive capacity: a new perspective on learning and innovation WESLEY M. COHEN AND DANIEL A. LEVINTHAL	235
43	The role of knowledge in R&D efficiency RICHARD R. NELSON	264
44	The use of knowledge in society F. A. HAYEK	281
45	The dominant role of users in the scientific instrument innovation process ERIC VON HIPPEL	293

CONTENTS

46	Profiting from technological innovation: implications for integration, collaboration, licensing and public policy	318
	DAVID J. TEECE	
47	The changing technology of technological change: general and abstract knowledge and the division of innovative labour	351
	ASHISH ARORA AND ALFONSO GAMBARDELLA	
48	The emergence of technology systems: knowledge production and distribution in the case of the Emilian plastics district	367
	PIER PAOLO PATRUCCO	
49	Licensing tacit knowledge: intellectual property rights and the market for know-how	390
	ASHISH ARORA	
50	University versus corporate patents: a window on the basicness of invention	412
	MANUEL TRAJTENBERG, REBECCA HENDERSON AND ADAM JAFFE	
51	Learning, internal research, and spillovers	444
	JAMES D. ADAMS	
52	Networks of innovators: a synthesis of research issues	489
	C. FREEMAN	
53	National innovation systems: why they are important, and how they might be measured and compared	515
	PARIMAL PATEL AND KEITH PAVITT	
54	The venture capital revolution	539
	PAUL GOMPERS AND JOSH LERNER	
55	The business governance of localized knowledge: an information economics approach for the economics of knowledge	565
	CRISTIANO ANTONELLI	

CONTENTS

VOLUME IV INNOVATION AND COMPLEXITY: THE MARSHALLIAN LEGACY

<i>Acknowledgements</i>	• •	vii
56 Hybrid corn: an exploration in the economics of technological change ZVI GRILICHES		1
57 A dynamic model of process and product innovation JAMES M. UTTERBACK AND WILLIAM J. ABERNATHY		26
58 Technology diffusion and the rate of technical change LUC SOETE AND ROY TURNER		45
59 Rational decision making in business organizations HERBERT A. SIMON		59
60 A failure-inducement model of research and development expenditure: Italian evidence from the early 1980s CRISTIANO ANTONELLI		89
61 In search of useful theory of innovation RICHARD R. NELSON AND SIDNEY G. WINTER		112
62 The organisation of capabilities BRIAN J. LOASBY		149
63 Technological paradigms and technological trajectories: a suggested interpretation of the determinants and directions of technical change GIOVANNI DOSI		175
64 Innovation, diversity and diffusion: a self-organisation model GERALD SILVERBERG, GIOVANNI DOSI AND LUIGI ORSENIGO		200
65 On the complexities of complex economic dynamics J. BARKLEY ROSSER JR.		226
66 From simplistic to complex systems in economics JOHN FOSTER		252
67 Complexity and empirical economics		276

CONTENTS

STEVEN N. DURLAUF

68	Why are institutions the 'carriers of history'?: path dependence and the evolution of conventions, organizations and institutions PAUL A. DAVID	298
69	Competing technologies, increasing returns, and lock-in by historical events W. BRIAN ARTHUR	317
70	Clio and the economics of QWERTY PAUL A. DAVID	336
71	Some fundamental puzzles in economic history/development DOUGLASS C. NORTH	344
72	Punctuated equilibria and technological progress JOEL MOKYR	359
73	Adaptive economic growth J. STAN METCALFE, JOHN FOSTER AND RONNIE RAMLOGAN	367
74	The economics of path-dependence in industrial organization CRISTIANO ANTONELLI	399
75	The system dynamics of collective knowledge: from gradualism and saltationism to punctuated change GRISTIANO ANTONELLI	434
76	Complex landscapes in economic geography PAUL KRUGMAN	462
77	Foresight, complexity, and strategy DAVID LANE AND ROBERT MAXFIELD	468
78	Increasing returns: historiographic issues and path dependence KENNETH J. ARROW	500
	<i>Index</i>	510