

TABLE OF CONTENTS

Executive Summary	11
-------------------------	----

Chapter 1

Regaining Momentum in Science, Technology and Industry

Introduction	20
A changing macroeconomic environment	20
Investments in science and technology	23
Capitalising on science and technology investments	32
Human resources for science and technology	36
Globalisation of science, technology and industry	39
Conclusion	43
Notes	44
References	45

Chapter 2

Recent Developments in Science, Technology and Innovation Policies

Introduction	48
Main directions for science, technology, and innovation policies	49
Strengthening public sector research and public research organisations	59
Support for business R&D and innovation	64
Enhancing collaboration and networking among innovating organisations	72
Human resources for S&T	75
Evaluating innovation policies	80
Notes	83
References	85

Chapter 3

Public/Private Partnerships for Innovation

Introduction	88
P/PPs for innovation: definition and typology	88
The increased use of P/PPs for innovation	92
Implementing efficient P/PPs: issues and good practices	94
Notes	105
References	106

Chapter 4

Promoting Innovation in Services

Introduction	114
Services are of growing importance in OECD economies	114

Innovation in services	122
Policies to promote innovation in services	136
Conclusion	140
Notes	141
References	142

Chapter 5

Ensuring the Supply of Human Resources in Science and Technology

Introduction	144
Will supply meet demand?	148
Meeting demand through immigration	156
What can governments do to foster domestic development of HRST?	161
Conclusion and outlook	163
References	165

Chapter 6

Multinational Enterprises and Productivity Growth: Insight at the Firm Level

Introduction	168
The changing role of MNEs in OECD economies	168
Firm-level insight into the contribution of MNEs to productivity growth	170
Conclusions and implications	177
Notes	180
References	181

Statistical Annex

Main OECD databases used	183
Standard statistical notes used in this publication for science and technology indicators	186
Standard industry aggregation by technology level	187
Annex tables	188

List of Tables

Chapter 1

1.1. Key economic variables	21
1.2. Examples of R&D spending targets in the OECD	25

Chapter 2

2.1. Summary of national plans for science, technology and innovation policy in OECD countries	51
2.2. Science and technology priorities in OECD countries	58
2.3. R&D tax incentives in OECD countries, 2004	66

Chapter 3

3.1. Major P/PP programmes in four countries	91
3.2. Share of P/PPs in competitive funding of research in France	92
3.3. P/PP objective and type of research	95
3.4. Selection process of the proposals for LTIs in the Netherlands	96
3.5. Some selection criteria reflecting public interest and private benefit	96
3.6. Differences between science and technology communities	98
3.7. Organisational models	99
3.8. Share of SMEs in the financing of 13 French public/private research networks, 2001	101
3.9. Indicators for the evaluation of Dutch LTIs	103
3.A.1.1. Comparative features of four P/PP programmes	107
3.A.1.2. List of co-operative research centres (networks) currently operating, classified by technological field ..	110

Chapter 5

5.1. National goals for human resources in science and technology	147
5.2. US graduate student enrolment in science and engineering, 1992-2002	156

Chapter 6

6.1. Labour productivity growth of US non-farm private businesses, by sector	173
6.2. Labour productivity growth in US non-financial corporations, by sector and industry	174
6.3. Differences in labour productivity in Belgium by type of firm	174

Statistical Annex Tables

1. Breakdown of GDP per capita into its components, 1990-2003	188
2. Income and productivity levels in the OECD, 1950-2002	189
3. Gross R&D expenditures, 1981-2003	190
4. GERD intensity, 1981-2003	191
5. GERD by source of funds, 1981-2003	192
6. GERD by two main sources of funds, as a percentage of GDP, 1981-2003	194
7. R&D expenditures by sector of performance, 1981-2003	195
8. GERD by sector of performance, 1981-2003	197
9. Business R&D expenditures, 1981-2003	199
10. BERD intensity, 1981-2003	200
11. Business R&D expenditures by source of funds, 1981-2003	201
12. Business R&D expenditures, by two main sources of funds, 1981-2003	203
13. Intensity in business R&D expenditures by sector, 1991 and 2001 or nearest years available	204
14. Business R&D expenditures by sector, 1991 and 2001 or nearest years available	206
15. R&D expenditures of affiliates under foreign control, 1991-2002	208
16. Share of public R&D expenditures financed by industry, 1981-2003	209
17. Basic research expenditures, 1981-2003	211
18. Basic research by performer, 1991-2003	212
19. Government budget appropriations and outlays for R&D by socio-economic objectives, 1991-2003	213
20. Tax treatment of R&D, 1990-2004	214
21. Total researchers per thousand employment, 1981-2002	215
22. Researchers by sector of performance, 1991-2002	216
23. Human resources in science and technology, 1995-2002	217
24. University graduates in science and engineering, 1988-2001	218
25. "Triadic" patent families by priority year, 1991-2000	219
26. Number of "triadic" patent families by priority year, 1991-2000	220
27. Science and engineering articles by country, 1988-2001	221
28. Portfolio of S&E articles by field, 1988-2001	222
29. Technology balance of payments, 1981-2002	223
30. Technology balance of payments, 1981-2002	224
31. Share of value added in total gross value added, 1991-2001	225
32. Trade-to-GDP ratio for goods and services, 1991-2003	227
33. Export ratio by industry and technology level, 1992-2002	228
34. Import penetration by industry and technology level, 1992-2002	231
35. Outward and inward foreign direct investment flows, 1990-2001	234

List of Figures*Chapter 1*

1.1. Technology balance of payments for OECD countries, 2002	22
1.2. Trends in R&D intensity, 1995-2003	23
1.3. R&D intensity in OECD countries, 2002	24
1.4. R&D funding in public research organisations, 1998 and 2002	27
1.5. Business R&D as a share of GDP in major OECD regions	28
1.6. Business R&D as a share of GDP in OECD countries, 1995 and 2002	29
1.7. Government funding of business R&D, 1991 and 2002	31
1.8. Scientific and engineering publications by country, 1991 and 2001	33
1.9. Patent filings in the main patent offices	34

1.10.	Number of triadic patent families	35
1.11.	Business researchers per thousand employees in OECD countries, 1995 and 2002.....	37
1.12.	Growth in employment in HRST occupations, 1995-2002	38
1.13.	R&D intensity in non-OECD economies as a share of GDP	39
1.14.	Regional and national shares of triadic patent families	40
1.15.	R&D investments by foreign affiliates, 1995-2001	41
1.16.	Changes in R&D spending by foreign affiliates, 1994-2000.....	42
1.17.	Outward investment in R&D by US-owned firms	42
<i>Chapter 3</i>		
3.1.	A typology of P/PPs.....	90
3.2.	P/PPs for research and innovation: basic rationale	93
3.3.	Expected benefits from a P/PP approach to innovation policy	93
3.4.	The eight selection rounds since the inception of the CRC programme (Australia)	95
3.5.	The WCFS organisational diagram.....	99
<i>Chapter 4</i>		
4.1.	Share of the market services in total value added, 1980 and 2001	115
4.2.	Contribution of market services to GDP growth, 1990-2001	116
4.3.	Service-sector value-added embodied in manufacturing goods.....	117
4.4.	Contribution of market services to job creation, 1990-2001	118
4.5.	Breakdown of labour productivity growth by main industrial sector.....	119
4.6.	Expansion of knowledge-based market services, 1990-2001 or nearest available year	119
4.a.	CIS3 respondents by sector and country	121
4.b.	CIS3 respondents by service sector and country	121
4.7.	Innovative density in the service and the manufacturing sectors, 1998-2000	122
4.8.	Average innovative density in the services and manufacturing sectors, 1998-2000	123
4.9.	Innovative density by size class, 1998-2000.....	123
4.10.	Breakdown of small firms by sector, innovative <i>versus</i> non-innovative firms, 1998-2000	124
4.11.	Product and process innovation in service and manufacturing sectors, 1998-2000.....	125
4.12.	Average intensity of business R&D expenditure (1995-2000) and innovative density (1998-2000), by sector ...	126
4.13.	Share of innovative firms by activity, 2000.....	127
4.14.	Growth of business R&D expenditures, 1990-2001	128
4.15.	Business R&D intensity in services and manufacturing, 1990 and 2001	129
4.16.	Growth of R&D intensity, services sector, 1990-2001	130
4.17.	Investment intensity in market services, 2001	131
4.18.	ICT investment in OECD countries, 1980-2001	131
4.19.	Software investment in OECD countries, 1980-2000.....	132
4.20.	Sources of information used by innovative firms in the service sector, 1998-2000	132
4.21.	Share of employees with higher education in the service sector, 2000	133
4.22.	Concentration of highly skilled employees in the services, by industry, 2000	134
4.23.	Factors impeding innovation in services and manufacturing	134
4.24.	Share of new firms in the population of innovative firms in manufacturing and services, 1998-2000.....	135
4.25.	Innovative density of new and established firms in the service sector, 1998-2000.....	136
4.26.	Public funding of manufacturing and service firms, 1998-2000.....	137
<i>Chapter 5</i>		
5.1.	Researchers per thousand in total employment, 2002.....	145
5.2.	Science and engineering degrees as percentage of new degrees, 2001.....	150
5.3.	Number of science and engineering graduates in G7 countries, 1998-2001	151
5.4.	Graduate rates at PhD levels, 2001	151
5.5.a.	Tertiary enrolment in science and engineering fields.....	152
5.5.b.	Average annual growth rate of new students, 1998-2002.....	153
5.6.	Number of US degrees awarded in science and engineering fields.....	155
5.7.	Share of new students enrolled in computing, 1998-2002	157
5.8.	Foreign PhD students as a percentage of total PhD enrolment, 2001	158
5.9.	Outward and return migration of Chinese students, 1991-2001	159
<i>Chapter 6</i>		
6.1.	Contribution of foreign affiliates to turnover and employment in manufacturing, 2001	169
6.2.	Growth in turnover and employment foreign affiliates in manufacturing, 1995-2001.....	170
6.3.	Contribution of foreign affiliates to turnover and employment in services, 2001	171
6.4.	Share of foreign affiliates in manufacturing R&D.....	172
6.5.	Relative productivity of foreign-controlled to domestically controlled plants.....	176

List of Boxes

<i>Chapter 1</i>	
1.1. The EU's 3% target	25
1.2. Business R&D in firms large and small	30
<i>Chapter 2</i>	
2.1. S&T policy in South Africa	53
2.2. Forms of public support for business innovation	64
2.3. Support to business innovation in China	71
2.4. HRST and S&T policy in Russia.....	75
2.5. Immigration reform for ICT workers in Australia	79
<i>Chapter 3</i>	
3.1. Stated objectives of two selected P/PP programmes	89
3.2. A special service unit to connect SMEs to a major P/PP – <i>Kunststoffenhuis</i> (Netherlands)	102
3.3. The measurement of additionality in the Austrian Kplus programme	104
<i>Chapter 4</i>	
4.1. Interpreting the results of the CIS3 survey.....	120
4.2. Activities which contribute to innovation	127
<i>Chapter 5</i>	
5.1. Globalisation of R&D and outsourcing of science and technology employment.....	146
5.2. Interpreting enrolment data.....	154
5.3. Supply and demand for ICT workers.....	157
5.4. Supply of science and technology graduates in non-OECD countries	160
5.5. Women in science and technology.....	162
<i>Chapter 6</i>	
6.1. Improving statistics on MNEs	178