Index

academic entrepreneurship 6, 7, 12, 13, 93, 102, 105, 107, 108, 111, 123
academic spin-off 7, 96, 107
active grid energy storage 117
administrative costs 72
agglomeration economies 59
aggregate economic growth 55
alliance capability 64
amorphous silicon 20, 45
anchor tenant 75, 77, 88
anchored clusters 75, 86
anti-dumping and countervailing duty investigations 73
anti-dumping tax and countervailing duties 73
architectural knowledge 26
artifacts 30
best research-cell efficiency 37, 40
bootstrapping 32
business entrepreneurship 6

cadmium telluride (CdTe) 20
capabilities and governance structures 58
catching up 1, 58, 59, 60, 64, 73, 112
cell efficiency evolution map 39
circulation of information 115
clean energy 16
cluster absorptive capacity 7
cluster innovation 8
comparative advantages 112
competence view of the firm 5
competitive advantage 5, 27, 121
complementarities 116
complementary infrastructures 30
complex products 53, 55
complexity 3
compound semiconductors 20
cost advantages 112
cost competitiveness 21
cost structures 27
crowds out 48
crystalline silicon PV 17
cultural dynamics 31
cultural evolution 31
cutting-edge innovation 112
decrease in the adverse impact 115
diffusion of innovation 33
digital storage 115
discontinuity 33
dispersal of technologies 116
disruptive innovation 29
disruptive technological change 29
distributed energy structures 79
distribution of clusters 8
divergence 11
dominant design 24, 25, 40, 54
dominant standard 40
downstream activities 87
DRAM (Dynamic Random Access Memory) industry 10
demand structures 27
demand-driven innovations 110
demand-side policy domination 119
dominant design 24, 25, 40, 54
dominant standard 40
downstream activities 87

dominant design 24, 25, 40, 54
dominant standard 40
downstream activities 87
Economic concentration 54
economic crisis 8, 88
economic dynamics 24
economic evolution 31
economies of scale 25, 110, 117
electricity generation 16
electricity mix 23
emergence of new radical innovations 33
emerging countries 54
emerging technologies 109
energy conversion efficiency 21
energy storage batteries and accumulators 52
entrepreneurial culture 87, 89
entrepreneurial orientation 6, 95
European Patent Office (EPO) 11
evolution path 50
evolutionary change 29
evolutionary economics 2
evolutionary innovation 29, 30, 31
evolutionary product and process 30
evolutionary technological change 28
'exaptive bootstrapping' 32
existence of anchor tenant 7
exponential growth 89
external economies 7
external environmental impacts 16
externalities 75, 117
fast-follower strategy 7
feed-in tariff 21, 38, 87, 88, 97, 119, 122
financial incentives 66
fiscal subsidies 119
flat panel displays 10
flexibility of manufacturing 59
fossil fuel 16, 21, 50
frequency conversion 20
frontier technology 29
gallium arsenide 20
gas exploration and production 48
gas-fired power plants 21
general purpose technology (GPT) 25
generation of novelty 30
geographic agglomeration 7, 13
geographic concentration 7
germanium (an amorphous silicon thin-film) 20
global average levelled cost 17
global entrepreneurship 59
global innovation system 59
global new investment 17
governance structures 58
government incentives 39
government research laboratories 44
governmental subsidies 21, 62, 73
governmental support 60
grand challenges 15, 113, 118
green certificates 21
grid parity 17
growth of firms 5
growth rate 17
hand-held calculators 96
heating and cooling systems 17
heavy investment outlays 63
historical context 59
history-friendly models 4, 5, 24, 27
horizontal innovation policies 67
horizontal technology policies (HTP) 62, 68
hot-carrier effects 20
human capital 5
hybridization 33
imbalance 1, 8
incremental innovation 30, 114, 116
industrial change 31
industrial competitiveness 27
industrial development 64
industrial dynamics 27, 64
industrial performance 13
industrial revolution 33
industrial strategies 58
industrial structure 42, 114, 121
Industrial Technology Research Institute (ITRI) 41, 82, 97
industry concentrates 25
industry evolution 27, 37, 39, 54
industry life cycle 4, 13, 24, 25
informality 89
information and communication technologies 1
in-house use 110
innovation capabilities 11
innovation cascade 13, 24, 27, 35, 39, 40, 45, 117, 120
innovation cascades 15, 29, 30, 32, 33, 34, 113, 114, 115, 116
innovation centres 33
innovation performance 1, 9
innovation policies 118
innovation strategies 58
innovative capability 10
institutional framework 59
institutional landscape 34
institutional settings 27
integrating production capabilities 112
integration capability 64
integrative production capabilities 13
integrative production competence 70, 73
integrator 38
intellectual property 7, 60
interaction of the organization and technology evolution 4
intermediate user firms 111
international influences 90
international and inter-regional collaboration 34
international knowledge flows 10
international mobilization of talent 59
international technology transfer 63
interrelationship 12
intranational knowledge flows 10
Investment Tax Credit (ITC) 21

knowledge creation 30, 117
knowledge diffusion 10
knowledge externalities 98, 116
knowledge flows 9, 27
knowledge leverage 10
knowledge source 11
knowledge transfer 12

labour force 25, 72
leapfrogging 61, 62, 64
learning curve 73
licensing 44
local citation 74
location advantages 60
lock-in 77

magnitude of innovation 109
maintenance and management costs 16
manufacturing efficiency 65
market formation policy 59
market knowledge 64
market novelty 29
market penetration rate 108

market premiums 21
market share 1
market sizes 27
marketing classification 121
marketing penetration rate 111
marketing positioning 39
mass market 38, 122
massive market demands 111
mechatronics sunlight trackers 55
metropolitan statistical areas 81
minimization of hierarchy 89
minor improvements 114
mobile telephone industry 11
monocrystalline silicon 45
multi-agent race 97
multifarious dynamics 29
multiple-carrier ejection techniques 20
multi-technology company 90

national innovation system (NIS) 75
national policies 90
national and regional systems 3
National Renewable Energy Laboratory 37, 40, 50
natural selection 32
net metering 21
network capabilities 6, 95
new artefacts 114
new functionalities 32
new-technology-based firms 6
niche market 38, 117, 105, 122
niche-accumulation 33
non-firm organizations 3
non-linearity 3

offshore wind costs 17
oligopolistic behaviour 32
onshore wind cost 17
open market 110
organizational capability 60
organizational diversity 89, 120
organizational ecology 31
organizational forms 32
organizational innovation 30
organizational structures 61
organizational transformations 114
organizations and industry structure 29
original innovators 26
out-of-grid electrical supply 45
The revolution in energy technology

patent citation 9, 10, 11
patent quality 10
path dependencies 31, 34
path-creating catch-up 59
path-following catch-up 58, 59
Perovskite solar cell 20
photovoltaic cell 11, 12, 98
photovoltaic cells 11, 12, 98
photovoltaic glass 99
PLC 5
PLC–ILC 25, 26, 27, 28, 35, 54, 55, 77
PLC–ILC model 4
pocket calculators 48
policy evolution 31
policy implication 8, 15
policy incentives 27, 34
policy priorities 60
polycrystalline 71
polymer solar cell 20
positive feedback dynamics 32
positive feedback loop 6
prefectures 81
process innovation 24, 54
process of the innovation 4
product diffusion 119
product innovation 25
product life cycle 4, 27
Product Life Cycle (PLC) 13, 24, 77
product renewal 26
product variation 55
production capacity 60, 63, 64
production supply prioritization 119
production technologies 60
productive capability 72
productive capacity 60
public knowledge 63
public laboratories 27
public policy 92
public research organizations 4, 37, 44, 75
publication and conferences 44
quantum dot solar cell 20

R&D-intensive organizations 78
radical innovation 4, 24, 25, 29, 33, 35, 114
radical novelty 114
regional agglomerations 79

regional innovation system 32, 67, 75, 77, 89, 116
regional knowledge spillover 7
related diversification 38
relative citation propensity 10, 11
renewable energy certificates 38
renewable portfolio standards (RPSs) 21
research route 8
resilience 7
resource-based and competence theories 107
resource-based theory 5
risk-taking 67
rooftop solar panels 48
scale-intensive and science-based industries 33
scarcity of research funds 105
scenario analysis 23
scholar-entrepreneurs 69
school–enterprise cooperative training programmes 70
Schumpeter Mark I 28
Schumpeter Mark II 28
science and technological innovation 18
science and technology progress 15
science-based industries and sectors (SBIS) 27
scientific infrastructure 63
secondary data collection 8, 12
sector life cycle models 4
sectoral system of innovation 1, 2, 3, 4, 14, 42
self-reinforcing mechanisms 34
self-sustained growth 73
serendipity 33
skilled human capital 6
Small Business Innovation Research Program (SBIR) 98
social matrix 32
socially desirable technological activities (SDTAs) 62
solar batteries 37, 78
solar cell 11, 12, 37, 79, 98
solar cell efficiency 21, 48
solar cell panels 21
solar cells 11, 12, 78, 79, 98
solar energy technologies 18
Index

solar energy transforming efficiency 71
solar exposure 79
solar glass 18, 37, 78, 79, 98
solar panels 17, 18, 23, 36, 38, 48, 53, 55, 78, 79, 90, 118
solar power 21
solar roof panel installation 100
solar roof panels 38
spatial distribution 13
specialized firms 111
specialized manufacturer 38
specialized semiconductors 41
spin-off formation 77
spin-offs 43, 44, 60
stage-skipping catch-up 59
standard engineering 28
star scientist 2, 5, 6, 12, 13, 93, 97, 98, 99, 102, 105, 107, 108, 111, 120
stasis and incremental change 29
subsidized tariffs 27
subsidy policies 23, 108
tax credits 27
tax incentives 119
technical novelties 32
techno-economic paradigm 13, 61, 63, 72
technological add-on 33
technological capability 8, 64
technological capacity 64
technological competencies 93
technological diffusion 1
technological infrastructure 26, 62
technological innovation 70, 108
technological paradigm 31
technological progress 112
technological regimes 27
technological revolutions 61
technological trajectories 34, 40, 45
technological trajectory 115
technological transitions 33
technology capability 63, 74
technology development 72
technology diffusion 30, 37, 61, 117
technology frontier 63
technology gaps 67
technology innovation 110
technology invention 41
technology novelty 29
technology opportunity 64
Technology Roadmap 16
technology transfer 6, 44, 68, 123
technology transfer offices (TTOs) 7, 95
terrestrial cell measurements 21, 39
theoretical contributions 120
theoretical framework 1, 2, 13
thermodynamic limits 20
thin film 20
three generations of technology 18
transformation rate 71
transnational technology diffusion 35, 45, 63
turnkey equipment 72
uniformed pricing 119
university spin-offs 6, 93, 95, 97
up-front installation 110
user entrepreneurs 109
user firms 108, 109, 110, 111
user innovators 38, 48
user-innovation sector 111
USPTO 37
vertical integration 109
vertical technology policies (VTP) 62
vertically integrated 110
wind turbines 16
window of opportunity 26, 61, 63