Index

1st Five-Year Plan (China) 120
Abraham, V. 250, 257
“absorptive capacity” 8, 56, 58–9, 61, 67, 89, 129–30, 140–41
“academic capabilities” 8, 15, 18, 56, 62–3, 67
“academic entrepreneurship” 71
Adeoti, J.O. 25, 47, 221
“affiliated suppliers” 152, 154
Albuquerque, E. 99, 162
Amsden, A. 18
ANPCyT (Agencia Nacional de Promoción Científica y Tecnológica) 100–101
“antennae” role 14, 17
apartheid 20, 24, 38
APITD (Action Plan for Industrial Technology Development) 69
applied sciences 146, 196, 210, 212–13
AREs (academic-run enterprises) 22
Argentina
and Asian UILs comparison 87
channels of information 159–60
degree of success of UILs 150, 151
firm innovation data 148–9, 150
impact of UILs on universities 257
interaction comparisons 9
modes of relationship 160–61
“moving thresholds” data 3–4
PRO–I interactions
benefits from 110–14, 178, 181, 186, 187, 192
channels of 164–5, 169–70, 176
comparative analysis 107–13
drivers of interaction 114, 115
historical roots of PRO–I interactions 98, 99–101
methodology 106
study data 169
“regimes of interaction” data 2–4, 5
S&E matrices of interaction
historical roots of “points of interaction” 213, 214–15, 216
matches and mismatches 216–18
matrix data 199–203
research methodology 197–8
US comparisons 210–12
trajectory of 2–4, 5
Arocena, R. 56, 247
Arza, V. 9, 10, 66, 96, 97, 166, 167, 221, 257
Azevedo, J.G. 227
basic sciences 212–13
Bayh–Dole Act (1980) 72, 160
Bekkers, R. 95, 191
benefits from PRO–I interactions
firms survey 178, 180–86, 192–3
international comparisons 191, 192–3
Latin American study 95–7, 106, 110–14, 117–19
motivations for firms and researchers 168
researcher survey 186–91, 193
“bi-directional” channel of interaction international PRO–I comparisons 170, 172, 174, 192
Latin American PRO–I study 97, 98, 108–9, 112–13, 117–18
motivations for PRO–I interactions 167–8
“big science” 42, 44, 90
BIOTEC (National Center for Genetic Engineering and Biotechnology) 70, 91
biotechnology sector 50–51
Bodas Freitas, I.M. 95, 191
“boomerang effect” 15
Boschma, R.A. 59
“branch plants” 72, 131
Developing national systems of innovation

Branscomb, L.M. 55–6, 75
Brazil and Asian UILs comparison 87
and “Changing Universities” programme 247
channels of information 159–60
constraints on industrialization 20
degree of success of UILs 150, 151
and dynamics of interactions 21
firm innovation data 148–50
and foreign-owned firms 221
and global interactions 25, 232,
233–4, 240–41, 242
health demands 19
impact of UILs on universities 257
interaction comparisons 9
modes of relationship 160–61
“moving thresholds” data 3–4
PRO–I interactions
benefits from 110–14, 178, 180,
182, 186, 188, 192
channels of 107–9, 112–14, 164–5,
170–71, 176–7, 191
comparative analysis 107–13
historical roots of PRO–I
interactions 98, 101–2
methodology 106–7
study data 169
“regimes of interaction” data 2–4, 5
S&E matrices of interaction
historical roots of “points of interaction” 213, 215–16
matches and mismatches 216–18
matrix data 206–10
research methodology 197, 198–9
US comparisons 210–13
sources of information for
technological innovation 152–8
trajectory of 2–4, 5
Callaert, J. 194
capitalism 14, 20, 195, 229
Carnegie Mellon Survey (CMS) 10, 12,
18, 34, 75, 124, 127, 146, 147, 194,
197–8, 251
Casas, R. 99, 214
Catalán, P. 225
Catch Up Project 6, 17, 18
CENIBIOT (Centro Nacional de
Innovaciones Biotecnológicas) 103
Chaebol firms 67–8, 74
“Changing Universities” programme
245–54, 258
“channels of information” data 158–60
channels of interaction
and “Changing Universities”
programme 252–3
PRO–I interactions
conceptual framework of study
166–8
firms survey 169–76, 191–2
international comparisons 164–5,
191–2
and knowledge transfer 164
Latin American study 94–7, 106,
107–10, 112–14, 117–19
researcher survey 176–8, 179–80,
191–2
study data 168–9
and transition of UILs in China
127–30, 138–40, 141–2
China
benefits from PRO–I interactions
180–81, 183, 185, 186–7, 189,
192
and “Changing Universities”
programme 253
channels of information 159–60
channels of PRO–I interaction
164–5, 172–3, 174, 177–8, 179,
191–2
degree of success of UILs 150
and dynamics of interactions 22
effectiveness of UILs in catch–up
process 90
firm innovation data 148–9
and foreign-owned firms 221
and GINs 223
global GDP share 148
and global interactions 233–4,
240–41
historical roots of UILs 71–2
interaction comparisons 8, 9
macro-institutional arrangements
73, 74–5
modes of collaboration 75–6, 78
modes of relationship 160–61
“moving thresholds” data 3–4
outcomes of UILs 82–3
PRO–I interaction study data 169
Index

289

“regimes of interaction” data 2–4, 5
regional/sectoral differences 85, 86
sources of information for
   technological innovation 152–8
trajectory of 2–4, 5
and transition of UILs
   channels of interaction 127–30,
      138–40, 141–2
current situation 136, 138–40
differing types of universities
      135–6, 137
historical background 120–23
importance of universities as
   knowledge source 131–6, 142
and knowledge transfer 123–4,
      126–7
S&T field 122–3, 126–7, 140, 142
survey data 124–6, 127
and UREs 121–2, 123, 126–7, 141
Chinese Academy of Sciences 120
Chunyan, Z. 31
CINVESTAV (Centro de Investigación
   y de Estudios Avanzados Unidad
      Mérida) 105
CNEA (Comisión Nacional de Energía
      Atómica) 100
CNPq (Conselho Nacional de
   Desenvolvimento Científico e
      Tecnológico) 198
cognitive proximity 60, 81, 85
Cohen, W.M. 1, 10–11, 21, 25, 61,
      75, 128–9, 141, 152–3, 155, 160,
      194–7, 199, 212–13, 252
Colyvas, J. 194
“commercial” channel of interaction
   international PRO–I comparisons
      170, 172, 174, 176–7, 192
Latin American PRO–I study 96,
      107–9, 113, 117, 119
motivations for PRO–I interactions
      167–8
Companhia Vale do Rio Doce (Brazil)
      215
CONACYT (Consejo Nacional de
   Ciencia y Tecnología) 104, 105
CONICET (Consejo Nacional de
   Investigaciones Científicas y
      Técnicas) 100, 102
Costa Rica
   and Asian UILs comparison 87
channels of information 159–60
degree of success of UILs 150, 151
firm innovation data 148–9, 150
impact of UILs on universities 257
interaction comparisons 9
modes of relationship 160–61
“moving thresholds” data 3–4
PRO–I interactions
   benefits from interactions
      110–14, 180, 182, 185, 186,
      188, 192
   channels of interaction 107–9,
      112–14, 164–5, 172, 177–8
   comparative analysis 107–13
   drivers of interaction 114, 115
   historical roots of PRO–I
      interactions 98, 102–4
   methodology 107
   study data 169
“regimes of interaction” data 2–4, 5
trajectory of 2–4, 5
Cozzens, S. 225
CSN (Companhia Siderúrgica
   Nacional) 215
Cultural Revolution (China) 22,
      121–2
customers (as knowledge source) 131,
      132, 133, 134
danwei system (China) 72
David, P. 56
degree of directness (UIL scale) 64
degree of formality (mode of
   interaction criteria) 166
degree of interaction (mode of
   interaction criteria) 166
Deng Xiaoping 22, 122
“developmental universities” 247, 255
DGP (Censo do Diretório dos Grupos
   de Pesquisa) 198–9
direction of knowledge flows (mode of
   interaction criteria) 166
Dosi, G. 22
Dubrée, Auguste 215
DUI (“doing–using–interacting”)
   mode of knowledge acquisition
      43, 44, 46
Dunning, J. 223
Dutrénit, G. 9, 61, 221
dynamics of interactions 21–3
early stages of development 15–18
economic benefits/motivations (in PRO–I interactions) 97, 110, 112, 166, 167, 193
Eight Letter Guideline (China) 121
Eighth Malaysia Plan (2001–2005) 69
EMOP (Escola de Minas – Ouro Preto) 215
Eom, B.-Y. 62, 69, 81
Ernst, D. 223, 224, 225, 227, 230
Escuela de Minera (Mexico) 213–14
Etzkowitz, H. 31
Eun, J.-H. 8, 10, 18, 21, 22, 62, 82, 221
Evenson, R. 17, 19
exports 35, 37, 47, 73, 214, 216
external environment (of firms) 60–61

Facultad de Agronomía de Buenos Aires (Argentina) 215
“failed states” 17, 24
FDI (foreign direct investment) 37, 58–9, 100
FINEP (Financiadora de Estudos e Projetos) 215–16
firms
“Changing Universities” programme 248–54, 258
and dynamics of interactions 21–3
future research directions 254–7, 258–9
and Global Innovation Networks see GINs
and global interactions 25–6, 225–31
historical perspective on structural change 23–4
IBM case study 234, 236–8, 242
importance of universities as knowledge source 131–6, 142
interaction comparisons 5–10
and methodology of studies 11
and multiple demands on universities and PRIs 19–20
and NSI framework 1
and patent data 231–41
PRO interactions see PRO–I interactions
statistics on patents and scientific papers 2
and technological innovation 161–2
and technological revolutions 15

and theoretical background of studies 11–12
and theoretical framework of studies 14
university–industry links see UILs
Foray, D. 56
formal contract-based channels 128–30, 138–9, 142, 253
framework of NSI 1
Freeman, C. 1, 14, 194
“frontier science” research 51
Fundación UNA (Fundación Pro Ciencia, Arte y Cultura de la Universidad Nacional) 103
FUNDATEC (Fundación Tecnológica de Costa Rica) 103
FUNDEVI (Fundación de la Universidad de Costa Rica para la Investigación) 103
Furtado, C. 213–14
GDP (gross domestic product) 2, 3, 4, 147–8
Gerschenkron, A. 20
GINs (Global Innovation Networks) 222–4, 225–8, 231–4, 241–2
GLF (Great Leap Forward) 120–21
global interactions
firm/university synthesis 225–31
and foreign-owned firms 221–2
and GINs 222–4, 225–8, 231–4, 241–2
IBM case study 234, 236–8, 242
interaction types 228–31
and MNEs 223, 224, 225–7, 228–31, 236–8, 240
and patents 231–41
and R&D 222–3, 224–5, 229
and streams of innovation 238–41
and theoretical framework of studies 25–6
and universities 222–4
Gollin, D. 17
governance mode (UIL scale) 64
Great Leap Forward (China) 22
GRIs (government research institutes) 55, 57, 67–8, 74, 77, 87, 90
GRMVs (Green Revolution Modern Varieties) 17, 19
Gutiérrez, M. 99
Heckman model 106–7, 114  
heterogeneity 19, 33–4, 52, 102  
historical perspective (on structural change) 23–4

IARCs (International Agricultural Research Centres) 17  
IBM (US multinational) 234, 236–8, 242  
IDRC (International Development Research Centre) 1, 6, 245, 247, 251–2  
Imbs, J. 34  
imports 36–7, 42, 50, 73, 93, 100–101  
INDEC (National Institute of Statistics and Censuses) 198

India  
benefits from PRO–I interactions 181, 184, 187, 190, 192  
and “Changing Universities” programme 250  
channels of information 159–60  
channels of PRO–I interaction 164–5, 172–3, 174, 177–8, 180, 191  
degree of success ofUILs 150  
firm innovation data 148–9  
global GDP share 148  
and global interactions 233–4, 240–41  
health demands 19  
historical roots ofUILs 72–3  
interaction comparisons 8, 9  
micro-institutional arrangements 73, 74  
modes of collaboration 75–6, 77  
modes of relationship 160–61  
“moving thresholds” data 3–4  
outcomes ofUILs 80–82  
PRO–I interaction study data 169  
“regimes of interaction” data 2–4  
regional/sectoral differences 85, 86  
research methodology 57–8  
Sources of information for  
technological innovation 152–8  
trajectory of 2–4  
Indian Institutes of Technology 73, 76  
Industrial Education and Academic-Industry Cooperation Promotion Act (2003) 68–9

informal interactions 42–3, 45–6, 107, 230–31  
“informal social networks” 230–31  
INGINEUS project 7, 222  
innovation benefits (in PRO–I interactions) 97, 111, 113  
institutional proximity 59–60  
Instituto Agronómico de Santa Catalina (Argentina) 215  
Instituto de Suelos (Argentina) 214  
Instituto Fitotecnia (Argentina) 214  
Instituto Microbiologia (Argentina) 214  
INTA (Instituto Nacional de Tecnologia Agropecuaria) 100, 214–15  
intellectual benefits/motivations (in PRO–I interactions) 97, 110, 112, 117–18, 119, 166, 167, 193  
internal capabilities (of firms) 60–61  
internal sources of knowledge 131–2, 133, 134  
International Human Genome Sequencing Consortium 228  
Internet 132–3, 134  
INTI (Instituto Nacional de Tecnologia Industrial) 100  
IPN (Instituto Politécnico Nacional) 104–5  
IPR (intellectual property rights) 64, 75, 223  
IPT (Instituto de Pesquisas Tecnológicas) 213  
IRPA (Intensification of Research in Priority Areas) 69  
ISI (Institute for Scientific Information) 2  
ITCR (Instituto Tecnológico de Costa Rica) 102, 103  
ITESM (Instituto Tecnológico y de Estudios Superiores de Monterrey) 104  
Joseph, K.J. 250, 257  
Journal of Development Studies 26  
Juma, C. 54  
KIET (Korean Institute for Electronic Technology) 17, 18, 21  
Kim, L. 18, 68, 163
Developing national systems of innovation

Klevorick, A. 1, 10, 25, 194, 195–7
knowledge-based economies 31–2, 35–8, 51–2, 54, 147
“knowledge capitalization” 247
knowledge transfer
and channels of PRO–I interaction 164
PRO–I interactions 94–5, 117–19
and transition ofUILs in China 123–4, 126–7
andUILs 55, 59–60, 64, 74, 88
Kruss, G. 8, 221, 255
Kuemmerle, W. 223

Lall, S. 63
Lam, A. 247
late development 16
learning systems 56
Lee, Keun 4–5, 18, 62, 69, 81, 251
León, C. 99, 214–15
Levinthal, D.A. 61
licensed technology 128, 160
LICs (low-income countries) 8
Liefner, I. 18
Likert scale 169
Liu, X. 56
Lorentzen, J. 7, 8, 10, 222
Losada, F. 99, 214–15
low-level equilibrium 35–6
Lundvall, Bengt-Ake 1

Macaya, G. 103
Malaysia
benefits from PRO–I interactions 181, 184, 192
channels of information 159–60
channels of PRO–I interaction 164–5, 174–5, 192
degree of success ofUILs 150–51
firm innovation data 148–9
and foreign-owned firms 221
historical roots ofUILs 69
interaction comparisons 8, 9
macro-institutional arrangements 73, 74
modes of collaboration 75–6
modes of relationship 160–61
“moving thresholds” data 3–4
outcomes of UILs 80–81
PRO–I interaction study data 169

“regimes of interaction” data 2–4
regional/sectoral differences 85
research methodology 57–8
sources of information for technological innovation 152–8
trajectory of 2–4
Mandel, E. 14
Mann–Whitney U tests 133, 135, 136
Mao Zedong 120
Marques, S. 15
Marx, K. 14
materials science 195, 196, 214
Mazzoleni, R. 55, 118
methodology of studies 11–13
Mexico
and Asian UILs comparison 87
channels of information 159–60
degree of success ofUILs 150
and dynamics of interactions 21
firm innovation data 148–9
health demands 19
impact ofUILs on universities 257
interaction comparisons 9
modes of relationship 160–61
“moving thresholds” data 3–4
PRO–I interactions
benefits from 110–14, 180, 183, 186, 189, 192
channels of 107–9, 112–14, 164–5, 170–71, 177–8, 179, 191
comparative analysis 107–13
drivers of interaction 114, 115
historical roots ofPRO–I interactions 98, 104–5
methodology 106
study data 169

S&E matrices of interaction
historical roots of “points of interaction” 213–14, 216
matches and mismatches 216–18
matrix data 203–6
research methodology 197, 198
US comparisons 210–12
sources of information for technological innovation 152–8
trajectory of 2–4, 5
Meyer-Krahmer, F. 95
MIGHT (Malaysia Industry–Government Group for High Technology) 69
mining industries 37, 40–41, 213–14, 215–16
MNEs (multinational enterprises) 223, 224, 225–7, 228–31, 236–8, 240
modes of interaction see channels of interaction
“modes of relationship” data 160–61
Mohamed, R. 7–8, 10
MOSTI (Ministry of Science Technology and Innovation) 69
motivation of the academic partner (UIL scale) 64
motivation of the industrial partner (UIL scale) 64
motivations for PRO–I interactions 166–8
“moving thresholds” 3–4, 5
Mowery, D.C. 145, 146
MTDC (Malaysian Technology Development Corporation) 69
MTEC (National Metal and Materials Technology Center) 70, 91
Nabudere, D.W. 254, 255
NANOTEC (National Nanotechnology Center) 70
Narin, F. 1, 25, 194
NARS (National Agricultural Research Systems) 17, 19
National Education Act (1999) 70
National Innovation Survey (Argentina, 2007) 198
National Innovation Survey (Mexico, 2006) 198
NECTEC (National Electronics and Computer Technology Center) 70, 91
Nelson, R.R. 1, 6, 7, 10, 15–16, 25, 55, 118, 224
New Economics of Science 62
Nigeria
benefits from PRO–I interactions 185, 186, 192
challenges to knowledge-based growth 36–7
and “Changing Universities” programme 250

channels of PRO–I interaction
164–5, 174–5
conceptual approach of study 33–5
features of UILs 42–3
firm innovation data 148–9
and foreign-owned firms 221
and global context of interactions 25
interaction comparisons 8
interactive capabilities 49–50
“moving thresholds” data 3–4
policy mechanisms 47, 52, 53
PRO–I interaction study data 169
promoting UILs 53
“regimes of interaction” data 2–4
study methodology 33–5
trajectory of 2–4
Noma, E. 194
NSTDA (National Science and Technology Development Agency) 70
Open Door policy (China) 122
organizational capabilities 59, 61, 62–3, 65
organizational proximity 59
Owen-Smith, J. 160

“passive” motivations for PRO–I interactions 166–7
Patel, P. 224, 225, 227
patents 2–5, 55–6, 127, 128, 160, 194, 231–41
Pavitt, K. 227
PECYT (Programa Especial de Ciencia y Tecnologia) 105
Pedro II, Emperor 215
Peterson, I.-H. 154
Pinho, M. 154
“points of interaction” 13, 21, 197, 203, 205–7, 210–17
PRIs (public research institutes)
and dynamics of interactions 21–3
and early stages of development 15–18
historical perspective on structural change 23–4
interaction comparisons 5–10
and knowledge-based economies 147
and methodology of studies 11
multiple demands on 19–20
Developing national systems of innovation
and NSI framework 1
role and relevance in NSI 145–6
sources of information for
technological innovation 151–6
statistics on patents and scientific
papers 2
and theoretical background of
studies 11–12
and theoretical framework of studies
14
“proactive” motivations for PRO–I
interactions 166–7
production benefits (in PRO–I
interactions) 97, 111, 113
PRO–I (public research organizations–
industry) interactions
benefits from interactions
firms survey 178, 180–86, 192–3
Latin American study 95–7, 106,
110–14, 117–19
motivations for firms and
researchers 168
researcher survey 186–91, 193
channels of interaction
conceptual framework of study
166–8
firms survey 169–76, 191–2
international comparisons 164–5,
191–2
and knowledge transfer 164
Latin American study 94–7, 106,
107–10, 112–14, 117–19
researcher survey 176–8, 179–80,
191–2
study data 168–9
international comparisons 191, 193
Latin American study
benefits from interactions 95–7,
106, 110–14, 117–19
channels of interaction 94–7, 106,
107–10, 112–14, 117–19
comparative analysis 107–13
drivers of interaction 114, 115,
119
features of interaction 114, 116
historical roots of PRO–I
interactions 97–105
and knowledge transfer 94–5,
117–19
methodology 105–7
and R&D 116
weakness of interactions 93–4,
98–102, 104–5
motivations for firms and
researchers 166–8
Project 211 (China) 86, 90
PROs (public research organizations)
and “Changing Universities”
programme 246, 249, 251
firm interactions see PRO–I
interactions
future research directions 259
and impact of UILs on universities
258
and S&E matrices of interaction
197–8
and UILs 58, 59, 64–5, 75, 77–8,
79–84, 88–9
“provisional end result” of studies 10
“public science” 160
questionnaires
“Changing Universities” programme
247–8, 249–50, 251–3, 254
Chinese UILs survey 124–6, 127
development of 12
and methodology of studies 11–12
R&D (research and development)
and absorptive capacity 58–9
Asian UILs study 64–5, 67–8, 79–82,
83, 88–9
and “Changing Universities”
programme 250, 253, 254
dynamics of interactions 21, 23
global interactions 25, 222–3,
224–5, 229
and internal capabilities 61
international PRO–I comparisons
170, 172, 174, 177
and Latin American PRO–I study
95, 103, 105, 116
and motivations for PRO–I
interactions 167, 168
and S&E matrices of interaction
194–6, 197–8, 207, 211
sub-Saharan Africa UILs study 34,
39–42, 44, 45, 46
and transition of UILs in China 128
“The Red Queen Effect” 5, 15
Index

Reddy, P. 256
Reform policy (China) 122
“regimes of interaction” 2–5, 18, 21
research tools 12–13
Resolution on the Reform of the
Science and Technology System
(1985) 71
respondent bias 151
Ribeiro, L.C. 194
Riguzi, P. 213
RoKS (Research on Knowledge
Systems) project 3, 5, 10–11, 26, 168, 197–8
Rosenberg, N. 1, 7, 10, 25, 145–6, 194
Rumbelow, J. 154

S&E (science and engineering) field
and early stages of development 17
matrices of interaction
and industrialization phases 216–18
literature background 194–7
matrix data 199–201
“points of interaction” 197, 203, 205–7, 210–17
and R&D 194–6, 197–8, 207, 211
research methodology 197–9
research questions 197
and strength/relevance of science 194–6
US matrices 210–13, 216–17
and research tools 13

S&T (science and technology) field
Asian UILs study 70–71, 74
and early stages of development 17
and global interactions 25, 234, 241
and key role of universities 32
PRO–I interactions 97–8, 100–101, 102, 103
and S&E matrices of interaction 195, 213, 217
and South Korean UIL dynamics 163
sub-Saharan Africa UILs study 44–5, 53
and transition of UILs in China 122–3, 126–7, 140, 142
Sabato, Ernesto 10
Sampat, B.N. 145, 146
satisfaction rates 80–81, 253
Schiller, D. 18, 66, 250
Schmoch, U. 56, 95, 194
Schumpeter, J. 14
SCI (Science Citation Index) 68
Science and Public Policy (journal) 26, 57
Science Policy Resolution (1958) 72
“science push” approach 47
scientific papers, statistics on 2–5
scientific production 2–4, 51, 105, 165
scope (UIL scale) 64
“self-selection” 81
Seoul Journal of Economics 26, 57
Sercovich, F. 8, 34, 52
“service” channel of interaction
international PRO–I comparisons 177–8, 191, 192
Latin American PRO–I study 96, 108–9, 112–13, 117
motivations for PRO–I interactions 167–8
Seventh Malaysian Plan (1996–2000) 69
short-term production activities 97, 116, 178, 180–81, 185, 192
SMEs (small and medium enterprises) 39, 45, 67, 74, 85
“social contracts” 71
social proximity 59
“socialist economic construction” 71
SOEs (state-owned enterprises) 136
Soete, L. 194
South Africa
challenges to knowledge-based
growth 37–8
conceptual approach of study 33–5
constraints on industrialization 20
and dynamics of interactions 21
features of UILs 39–41
firm innovation data 148–9, 150
and foreign-owned firms 221
and global interactions 233–4, 240–41
health demands 19
interaction comparisons 8, 9
interactive capabilities 50–51
“moving thresholds” data 3–4
policy mechanisms 47–8, 52, 54
promoting UILs 54
“regimes of interaction” data 2–4, 5
Developing national systems of innovation

sources of information for technological innovation 155–8
study methodology 33–5
trajectory of 2–4, 5
South Korea
benefits from PRO–I interactions 181, 185, 187, 190, 192
and “Changing Universities” programme 254
channels of PRO–I interaction 164–5, 172, 174
degree of success of UILs 150–51
and dynamics of interactions 21, 163
and early stages of development 17, 18
effectiveness of UILs in catch–up process 88, 90
firm innovation data 148–9
and GINs 227
and global interactions 233–4
historical roots of UILs 67–9
interaction comparisons 8, 9
and Latin American PRO–I comparison 117
macro-institutional arrangements 74–5
modes of collaboration 75–7
“moving thresholds” data 3–4
outcomes of UILs 80, 82–3
PRO–I interaction study data 169
“regimes of interaction” data 2–5, 18, 21
regional/sectoral differences 85–6
research methodology 57–8
and technological revolutions 14–15
trajectory of 2–5
Soviet Union 120
spatial proximity 60
Special Research Institute Promotion Law (1973) 68
“spots of interaction” 13, 17
statistics on patents and scientific papers 2–5
structural change 23–4, 34, 36
Sutz, J. 56, 247
Suzigan, W. 99, 162

technological capabilities 56, 60–61, 63, 67, 140, 147

technological intensity 39, 151

technological production 2–3, 5, 102

technological revolutions 14–15, 24
“technology market” 122–3

technology transfer 47, 49–50, 53, 54, 194
Technology Transfer Promotion Law (2001) 68
Terreblanche, S. 20
tertiary education 59
Teubal, M. 8, 34, 52
Thailand
and “Changing Universities” programme 252
firm innovation data 148–9, 150
and foreign-owned firms 221
historical roots of UILs 69–71
interaction comparisons 8, 9
macro-institutional arrangements 73–4
modes of collaboration 75–6, 77, 79
“moving thresholds” data 3–4
outcomes of UILs 80, 84
“regimes of interaction” data 2–4
regional/sectoral differences 85, 86
research methodology 57–8
trajectory of 2–4
theoretical background of studies 10–11
theoretical framework of studies 13–26
time restrictions 139, 140
TLOs (Technology Licensing Offices) 68, 69
TNCs (transnational corporations) 15, 20, 23, 25
“traditional” channel of interaction international PRO–I comparisons 170, 172, 174, 176–7, 191, 192
motivations for PRO–I interactions 167–8
transaction-cost economics 10, 65
“transition of phases” approach 8
transnational interactions 227, 228–31
“transnational technologies” 7, 25, 26, 221
Triple Helix approach 10, 62
trust 130, 142, 231
UILs (university–industry links)
and absorptive capacity 56, 58–9, 61, 67, 89
and academic capability 56, 62–3, 67
Asian study
comparison with Latin America 87–8
effectiveness of UILs in catch-up process 88–92
future research 91–2
historical roots of UILs 67–73
macro-institutional arrangements 73–5
modes of collaboration 64–5, 75–9
outcomes of UILs 65–6, 79–84
public-policy interventions 91
and R&D 64–5, 67–8, 79–82, 85, 88–9
regional/sectoral differences 66–7
research methodology 57–8
"Changing Universities" programme 245–54
future research directions 254–7, 258–9
global interactions see global interactions
impact on universities 257–8

UAM (Universidad Autónoma Metropolitana) 104–5
UFMG (Universidade Federal de Minas Gerais) 215–16
Uganda
challenges to knowledge-based growth 35–6
and “Changing Universities” programme 250, 254
conceptual approach of study 33–5
features of UILs 43–5
firm innovation data 148–9
interaction comparisons 8
“moving thresholds” data 3–4
and multiple demands on universities and PRIs 19
policy mechanisms 46–7, 52, 53
promoting UILs 53
“regimes of interaction” data 2–4
study methodology 33–5
trajectory of 2–4

UILs (university–industry links)
and absorptive capacity 56, 58–9, 61, 67, 89
and academic capability 56, 62–3, 67
Asian study
comparison with Latin America 87–8
effectiveness of UILs in catch-up process 88–92
future research 91–2
historical roots of UILs 67–73
macro-institutional arrangements 73–5
modes of collaboration 64–5, 75–9
outcomes of UILs 65–6, 79–84
public-policy interventions 91
and R&D 64–5, 67–8, 79–82, 85, 88–9
regional/sectoral differences 66–7
research methodology 57–8
"Changing Universities" programme 245–54
future research directions 254–7, 258–9
global interactions see global interactions
impact on universities 257–8

and knowledge-based economies 32
and knowledge transfer 55, 59–60, 64, 74, 88
and learning systems 56
and patents 55–6
and PROs 58, 59, 64–5, 75, 77–8, 79–84, 88–9
and proximity 59–60
role of universities in NSI 147
S&E matrices of interaction
and industrialization phases 216–18
literature background 194–7
matrix data 199–201
“points of interaction” 197, 203, 205–7, 210–17
and R&D 194–6, 197–8, 207, 211
research methodology 197–9
research questions 197
and strength/relevance of science 194–6
US matrices 210–13, 216–17
sub-Saharan Africa study
challenges to knowledge-based growth 35–8
case conceptual approach 33–5
effectiveness of UILs 32–3
features of UILs 38–46
interactive capabilities 48–51
methodology 33–5
policy mechanisms 46–8, 51–4
promoting UILs 51–4
R&D 34, 39–42, 44, 45, 46
technology transfer 47, 49–50, 53, 54
survey exploration
channels of information 158–60
data set 147–50
degree of success of UILs 150–51
modes of relationship 160–61
sources of information for technological innovation 151–8
and technological innovation 161–2
and technological capability 56, 60–61, 63, 67
transition in China
channels of interaction 127–30, 138–40, 141–2
Developing national systems of innovation

current situation 136, 138–40
differing types of universities 135–6, 137
historical background 120–23
importance of universities as knowledge source 131–6, 142
and knowledge transfer 123–4, 126–7
S&T field 122–3, 126–7, 140, 142
survey data 124–6, 127
and UREs 121–2, 123, 126–7, 141
UNA (Universidad Nacional de Costa Rica) 102–3
UNAM (Universidad Nacional Autónoma de México) 104–5
UNCTAD study (2005) 227
UNED (Universidad Estatal a Distancia) 102
universities
“antennae” role of 14, 17
“Changing Universities” programme 245–54, 258
creation of 13, 16–17
and dynamics of interactions 21–3
and early stages of development 15–18
future research directions 254–7, 258–9
and GINs 222–4, 225–8, 232, 241–2
and global interactions 25–6, 222–4, 225–31, 232
historical perspective on structural change 23–4
impact of UILs on 257–8
interaction comparisons 5–10
and knowledge-based economies 31–2, 35–8, 147
as knowledge source for firms 131–6, 142
and Latin American PRO–I study 93–4, 98, 99, 101–4
and methodology of studies 11
multiple demands on 19–20
and NSI framework 1
role and relevance in NSI 145–7
sources of information for technological innovation 151–6
statistics on patents and scientific papers 2
and technological innovation 161–2
and technological revolutions 14–15, 24
and theoretical background of studies 11–12
and theoretical framework of studies 14
university–industry links see UILs
“university capabilities” 15, 18, 21
UREs (university-run enterprises) 8, 22, 71, 72, 74, 75, 121–2, 123, 126–7, 141
USA (United States of America) 152–61, 210–13, 216–17, 238–41, 242
USPTO (United States Patent and Trademark Office) 2, 99, 104, 231–2
Vázquez, C. 167
Verbeek, A. 194
Viotti, E.B. 56
“virtuous cycles” 231
Wacziarg, R. 34
Weesakul, B. 71
White, S. 56
WHO (World Health Organization) 230
Williamson, O. 22
“world-level challenges” 225
Yale Survey 10, 12, 18, 146, 147, 194–5, 197–8, 251
Zitt, M. 194