## About the Series Editors

José E. Cassiolato teaches Innovation Studies and is the coordinator of RedeSist (Research Network on Local Productive and Innovation Systems) at the Institute of Economics, Federal University of Rio de Janeiro, Brazil. During 2011–2012 he was the President of the Scientific Board of Globelics, Global Research Network on the Economics of Learning, Innovation and Capacity building Systems where he coordinated the Research Project — A Comparative Study of the National Systems of Innovation of BRICS Countries. He has been Visiting Professor at the Université de Rennes (since 2001) and teaches at the Globelics Academy—School on National Systems of Innovation and Economic Development, Portugal and Finland (since 2004).

Maria Clara Couto Soares is a sociologist and political scientist, and is currently working as Senior Researcher at RedeSist, Institute of Economics, Federal University of Rio de Janeiro, Brazil. She was previously Science and Technology Policy Researcher at the Ministry of Science and Technology and at CNPq-National Council for Scientific and Technological Development, Brazil. Her main areas of interest are in national innovation systems, S,T&I policies, social innovation and sustainable development. This page intentionally left blank

## About the Editors

**Mario Scerri** is Professor of Economics and Senior Research Fellow, Institute for Economic Research on Innovation (IERI) at the Tshwane University of Technology, South Africa. He is also Director of the Institute for Comparative Studies in Local Development based in Mozambique. His research focus is on the evolution of innovation systems, specifically within southern Africa, from a political economy perspective. He has worked and written on the measurement of innovation, on the teaching of undergraduate economics and the economics of innovation. He is the author of the book *The Evolution of the South African System of Innovation since 1916* (2009) and co-editor of *Measuring Innovation in OECD and non-OECD Countries* (2006).

Helena M. M. Lastres is Head of the Office for Local Production and Innovations Systems and Regional Development, Brazilian Development Bank (BNDES). Her main areas of interest include development and science, technology & innovation (S, T&I) policies; economics of knowledge and innovation; financing of national/ local production and innovation systems in the BRICS nations. Her recent publications include the co-edited volume Systems of Innovation and Development: Evidence from Brazil (2003). She has also contributed to the edited book BRICS and Development Alternatives: Innovation Systems and Policies (2009) and in the journal Innovation: Management, Policy and Practice. This page intentionally left blank

## Notes on Contributors

José Luis Gordon is an economist and Associate Researcher at Research Network on Local Productive and Innovative Systems (Redesist). He is currently an advisor to the Brazilian Minister of Science, Technology and Innovation. Before that, he was an economic analyst at the National Confederation of Industry of Brazil in the area of economic policy.

**Priscila Koeller** is an economist and is currently Analyst at the Directorate of Surveys at the Brazilian Institute of Geography and Statistics (IBGE) and Associate Researcher at the Research Network for Local Production and Innovations Systems (RedeSist). She was previously the Adviser to the Executive Secretariat at the Brazilian Ministry of Science and Technology. She has published articles related to Innovation Policy and Systems, Economic Statistics and Innovation Indicators which are her research focus.

**V. V. Krishna** is Professor of Science Policy at the Jawaharlal Nehru University, New Delhi. He has published 40 research papers and five books. He is the founder-editor and currently Editor-in-Chief of international journal *Science*, *Technology and Society*. He is consultant to EU and has visiting positions at University of New South Wales, Sydney and Institute of Advanced Study, United Nations University, Japan.

Tatiana Kuznetsova is Director of the Centre for Science and Innovation Policies (Higher School of Economics, Moscow). Her research competence covers studies on S&T and innovation policy and indicators, etc. She has authored over 350 publications and has taken part in different international projects, acting as a consultant to government agencies and is part of the editorial board of journal *Foresight* (Russia).

Lv Ping is Associate Professor at the University of Chinese Academy of Sciences in China. Her research interests include

international business strategy, globalization and innovation in the context of emerging markets, and regional innovation system. She has published a number of articles and chapters in books. She has taken part in various research projects sponsored by the EU, NNSF (China), Riksbankens Jubileumsfond, Swedish Research Council, among others.

## Index

863 Programme, China 216 Accelerated and Shared Growth Initiative for South Africa (AsgiSA) 252, 287, 291, 294 Adelzadeh, A. 301n3, African Institute of Mathematical Sciences xx African National Congress (ANC) 251 Altman, M. 301n4 Anglo-Boer war 249 apartheid, in South Africa: concern regarding unique labour market system 251; constraints on development 296; economic geography of 250, 251, 264, 275, 296; establishment after World War II 250; impact of 273; post-apartheid era 251-53, 254, 260, 264, 277 Asian Tigers xix Bajaj, Rahul 153 Balram, P. 152 bantustans 250–51, 264, 276, 277, 297, 303n15 Beijing High-Tech Industry Pilot Zone 199, 218 Bhabha, Homi 143, 145, 152 Bhan, S. K. 152 Bhargava, P. M. 152 Bhatnagar, S. S. 143, 145, 152 black, in South Africa 268, 287, 296

Bolsa Familia (Poor Family Support Pension) 61–62 Bose, J. C. 141 BPO 160, 291 Brazil: Action Plan for Science, Technology and Innovation 57–58; analysis of innovation policy in 25; BNDES programmes aimed at innovation 77; Bolsa Familia (Poor Family Support Pension) 61–62; Brazilian Court of Audit (TCU) 39; Brazilian Federal Agency for the Support and Evaluation of Graduate Education (CAPES) 32, 44–45; Cooperation Enterprise/Technological Institution 40; Council of Scientific and Technological Development 34–36; development policy based on an industrialisation model 23, 25–26; domestic capital 27; evolution of 25–31; exports, expansion of 55; Family Pension Programme (FPP) 62; Federal Agency for the Support and Evaluation of Graduate Education 32; fixed investment, expansion of 55; foreign capital enterprises 26; 'general subjects' projects

39; Gini Index for 63; gross domestic product (GDP) 26-27; gross value added at basic prices 49; human resource capabilities 27; Index of the Basic Education Development 65; industrial output of general industry, composition of 47-48; Industrial, Technological and Foreign Trade Policy (PITCE) 29-30, 39, 54-56; inflation rate 28; information technology 27; innovation activities, funding of 33; Innovation Law (Law no. 10.973) 33; innovation system, specificities and heterogeneities of 49-53; innovative capital 42-43; institutions and policies of the state, periodisation and analysis of 31-32; International Standard Industrial Classification of All Economic Activities (ISIC) 71n14; Law of the National Education Guidelines (LBD) 50; legal framework of innovation policy 78–79; Lei da Inovação (Law of Innovation) 33; Lei do Bem (Law of the Goods) 33; Local Productive Arrangements/ Systems, policy of 41; market-led policies 28; MDIC programmes related to innovation 76-77; Ministry of Development,

Industry and Foreign Trade 31, 39–42; Ministry of Science and Technology (MS&T) 29, 31, 32–34, 36, 57; National Bank of Social and Economic Development (BNDES) 32, 42-44; National Campaign for Improving Higher Education 44; National Classification of Economic Activities (CNAE) 71n14; National Confederation of Industry (CNI) 57; National Council of Scientific and Technological Development 32; National Policy of Science, Technology and Innovation (PNCTI) 29, 30, 65; National Science Indicators (NSI) 45, 64; national system of innovation 17, 23, 29; per capita income by region 50; Plan for Development of Education (PDE) 58, 64–65; 'Plano Brasil Maior' (Brazilian Major Plan) 69; Policy for Production Development (PDP) 30, 39; private expenditures on R&D, rise in 55; production structure, evolution of 45–49; Programme for the Acceleration of Growth (PAC) 57; Programme of Micro, Small and Medium Enterprises (2007) 40; Programme of Support to Implementation of

the Brazilian System of Terrestrial Digital TV (PROTVD) 43; Programme of Support to the Development of the Health Industrial Complex (PROFARMA) 43; public direct investment per student 52; public elementary education 52; 'Real Plan' (Plano Real) of 1994 29; regional inequalities 24; School Census and Evaluation System of Basic Education (SAEB) 65; scientific and technological institutions (STIs) 36-37; second industrial revolution 26; sectoral funds 29, 32, 37, 55, 59; social and regional heterogeneities and disparities 23-24, 31; social inequalities 24; social issues 24; standards of living 24; state policy and state institutions, outcomes of 65–67; state policy towards science, technology and innovation 53–65; 'stop and go' policy 29; structuralist school 24, 26, 69n2; Studies and Projects Funding Agency (FINEP) 32, 34, 36–39; system of innovation, specificities of 45–53; technological fund 42; Technological Fund (FUNTEC) 42; Technological Innovation 43; technology-based

enterprises, emergence of 33; total scholarships in the country and abroad 79; trade balance 29; trade tariffs 27; 'two lost decades' 28; underdevelopment, issue of 24; Unified Register of Social Programmes (CadÚnico) 62; university–industry relations 31; Vocational Technical Centres 58

- Brazilian Agricultural Research Corporation (EMBRAPA) 26
- Brazilian Federal Agency for the Support and Evaluation of Graduate Education (CAPES) 32, 44–45
- Brazil, Russia, India, China, and South Africa (BRICS) 1–3, 5, 15, 18–19, 133, 138, 293
- Bretton Woods organisations xl
- BRICS countries: average rates of growth of real GDP xxxiv; bilateral trade flows xxxviii; economic performance of xxxiii; foreign direct investment (FDI) xxxix–xl; foreign trade and share of GDP xxxviii; human development indexes xlii; increasing relevance of xxxii– xliii; manufacturing sector xxxv; merchandise trade value xxxvii
- BRICS national system of innovation (NSI) xxiii– xxiv; commonalities in characteristics of 18; concept of 2; definition of xxvi, 6–8,

10–11; development of new policy models 3; evolution of xliii; financing investments xlvi; general theory of 7; national character of xxvi–xxvii; perspective of xxv–xxii; portrayal of xxviii–xxix; science, technology and innovation (STI) policy 8; technoeconomic paradigms and xxx; theoretical validity of 18 Broad-Based Black Economic

- Empowerment 287, 296 business sector, China 201; tax incentives for innovation in 230–31
- capital investment 274, 284; in China 193 Cassiolato, J. E. 7, 23-24, 37, 46, 188 China: 863 Programme 216; Banking Regulatory Commission 230; capability of innovation main performers 208-10; Chinese Academy of Sciences (CAS) 190, 192, 219, 224-25, 227; Chinese Communist Party (CPC) 191-92, 196; constraints in innovation environment 211; decentralisation 195; development model 189; economic structure of 203; education and science popularisation, enhancement of 229-30; efficient allocation of science and technology

resources 240; enterprisebased reforms in 225-26; evolution of current form of state 192-96; exports of high-tech products in 205; financial policies 221; first phase of innovation (1985-1992) 198-99; greatleap-forward 189, 192; gross domestic product (GDP) 189; 'high-growth with low-carbon' strategy xliii; Hundred Talents Programme 227; innovation capability of 190-92; innovation culture 211-12; institutional and structural weaknesses of the NSI 238; institutional framework of the NSI 239; macro policy design and management system 207; Management Measures of Special Funds in National Key Basic Research Development Programme 228; market economy 196; mechanism of innovation 210; Ministry of Finance 228, 231-32; Ministry of Science and Technology 181, 189, 192, 201-2, 216, 220, 223, 227-31, 236; National High-Tech Industrial Development Zones 231, 236; national system of innovation in, see national system of innovation (NSI), China; patents in, see patents, in China; periodisation and analysis of institutions and

policies 196–97; policy and institutions outcomes on NSI 233–38; policy to attract multinational companies xl; policy towards science, technology and innovation (STI) 188; primary industry in 203-4; Promotion Law of Commercialisation of Scientific and Technological Achievements 201; R&D intensity 233; reform of science and technology system 239; regional disparities in economic and social development 190-91; regional imbalances in innovation capability in 191–92; relaxation of administrative control on whole economy 195; role and emergence of mixed economy since 1978 194-96; role in centrally planned economy prior to 1978 193-94; science and technology evaluation and monitoring mechanism 241; science and technology programmes 192-93, 206, 237, 239-40; science and technology sector 217; second phase of innovation (1992-1998) 199-200; Spark Programme 216; specificities of innovation system 203–12; specificities of innovation system and relationship with state 203–12; state control 195; structural changes in the NSI 238; sustainable

development in 219; Talents, Patents and Technology Standards 219–20; tax incentives for innovation 230–31; technology market, development of 214–15; third phase of innovation (since 1998) 200–203; 'three capital' enterprises 195; Torch Programme 216–17, 236; venture capital 202, 230, 235, 239

- Chinese Academy of Engineering (CAE) 192
- Chinese Academy of Sciences (CAS) 190, 192, 219, 224–25, 227
- Chinese Academy of Social Sciences (CASS) 192
- Chinese Communist Party (CPC) 191–92, 196, 201, 214, 217, 219, 222–24
- Citigroup Global Markets xx 'Conception of a Long-Term Development until 2020' (CLTD 2020) 82–83, 124; main elements 83; target indicators for NSI development 84
- Council for Mutual Economic Assistance (COMECON) 14, 16
- Council for Scientific and Industrial Research (CSIR), South Africa 260
- credit guarantee system, in China 230
- crisis: global capitalism 1; system crisis 87

- Critical Technologies of the Russian Federation 105–8, 116
- Dantas, M. 50–52
- Defence Research and Development Organisation (DRDO), India 144
- Department of Arts, Culture, Science and Technology (DACST), South Africa 254–56, 258–60, 277, 278, 294
- Department of Atomic Energy (DAE), India 144, 185n26
- Department of Basic Education, South Africa 261
- Department of Biotechnology (DBT), India 148, 169
- Department of Electronics (DoE), India 147
- Department of Environment (DoEn), India 148
- Department of Higher Education and Training (DHET), South Africa 261
- Department of Ocean Development (DoD), India 148
- Department of Science and Technology (DST), South Africa 253
- Department of Space (DoS), India 147, 185n31
- Department of Trade and Industry (DTI), South Africa 257, 259
- development: analytical models, taxonomies and policy prescriptions 7; appropriate 6, 24, 105, 151; coordinated

3; economics 8, 12; global trends 82; inclusive 164, 182; innovation-driven 82–83, 101; leap 12, 14; long-term sustainable development 108, 118, 219, 232, 273; national specificities 82; policy models 3–4; regional and social 3; regional and social development 3; regional disparities and income distribution 8

- development model, China: constraints of traditional 189–90; GDP per capita in 2003 and 2008 189; scientific output, increase in number of 189
- disparity 52
- domestic industry 43, 69
- DST Ministerial Review Committee report (2012) 253, 299–300
- economic development, neo-Schumpeterian perspective of xxxi
- economic history, of South Africa 262–63
- economic structure, of China 203
- education institutions 50, 84, 89–91, 96, 110–11, 130, 141, 158, 201
- Electricity Supply Commission (ESKOM), South Africa 249
- energy 39, 46, 116, 124, 143, 154–55, 159, 162, 165, 169– 70, 178, 180, 215–16, 236, 263, 280, 284, 291, 293, 297

enterprise-based reforms, in China 225–26

exports composition, in South Africa 310

exports of high-tech products, in China 205

Family Pension Programme (FPP), Brazil 62

financial crisis 9, 17, 49, 82, 84–85, 118, 123, 128, 130–31, 133, 253, 275, 298

financial policies, in China 220–22

foreign direct investment (FDI) xxxix–xl, 152, 189, 218, 239, 252, 286, 300

fossil-fuel CO2 emissions xlii

'Four Cardinal Principles', China 195, 241n5

Freeman, C. 7, 19n3, 24

Furtado, Celso 19n1, 24, 69n2

- Gandhi, M. K. 141, 143
- Ghosh, J.C. 145

Gini Index, for Brazil 63

global capitalism 1

global financial and economic crises 1, 9, 84

Globelics network xxiv-xxv

Gokhberg, L. 80, 103, 117, 121, 124, 134n7, 135n12

green and environment-friendly technologies 150, 162

gross domestic expenditure on research and development

(GERD) 233–34, 265–66

gross domestic product (GDP) 26–27, 80–81, 83, 85–86, 96,

138, 158–60, 163–64, 174–75, 180

HEI enrolments, in South Africa 270, 313

higher educational institutions (HEIs) 84, 91, 110, 111, 130, 158, 160–61

human capital 106, 112, 117–18, 129; development of 14, 17, 289–92; and knowledge generation in South Africa 270

Human Development Index (HDI) xlii; South Africa 274–75, 290, 310

human potential for R&D and innovation activity 117–18

human R&D capital development 267–71

Human Resource Development Strategy for South Africa (2001) 290

Human Sciences Research Council (HSRC), South Africa 259–60

income inequality 296; Ginicoefficient 308; poverty and 274–75; in South Africa 274–75, 309

India: aerospace sector 176; agricultural sector xxxvi; appropriate innovation policy measures 156, 178–79; A. V. Hill Committee Report 143; biotechnology, ICT and material sciences 151; Biotechnology Industry Partnership Programme (BIPP) 169; Council of Scientific and Industrial Research (CSIR) 144; Defence Research and Development Organisation (DRDO) 144; Department of Atomic Energy (DAE) 144; Department of Science and Technology (DST) 156, 162, 175; Facilityfor-Antiproton-and-Ion-Research (FAIR) project 171; Five Year Plans related to S&T 146, 150, 168; Foreign Exchange Regulation Act (FERA), 1973 147; Gandhian model of development 143; globalisation and 156; 'Green Revolution' and 'White Revolution' 149–50; India-EU partnerships in S&T 170-71; Indian Council of Agriculture Research (ICAR) 144; Indian Council of Medical Research (ICMR) 144; Indian Institutes of Technology (IITs) 144, 168; Indian Science Congress 142-43, 183n4, 184n24, 184n25, 185n26; information and communication technology (ICT) xxxvi; innovation ecosystem 167, 174, 180; innovation governance structure in 161–62; Innovation in Science Pursuit for Inspired Research (INSPIRE) 168; liberal economic policies 151-52, 174; Ministry of

Science and Technology 163, 169, 181; modern universities 140; Monopolies and Restrictive Trade Practices (MRTP), 1969 147; nano mission 170; National Commission on Science and Technology (NCST), 1972 149; National Innovation Act (2008) 184n22; National Innovation Foundation 182; National Science and Engineering Research Board (NSERB) 167–68; national system of innovation (NSI), see national system of innovation (NSI), India; Nehru's views and a framework on science policy 142–43; New Economic Reforms, 1991 151-52; New Millennium Indian Technology Leadership Initiative (NMITLI) 169; Patent Act (1970) 147, 179; Promotion of University Research and Scientific Excellence (PURSE) 168; Protection and Utilisation of Public Funded Intellectual Property Bill (2008) 162, 169, 181; public-private partnerships in science education 169; public-private research systems 169; R&D tax incentive system 181; Scientific Policy Resolution (SPR) 139, 145-46; software services clusters 182; struggle against colonial science policies 141; technology

forecasting 156; Technology Information Forecasting and Assessment Council (TIFAC) 156; 'Technology Missions' mid-1980s 151; Technology Policy Statement (1983) 150

India 2020—Vision for the New Millennium 156

Indian Council of Agriculture Research (ICAR) 144

Indian Council of Medical Research (ICMR) 144

Indian Institutes of Technology (IITs) 144, 168

Indian Science Congress 142– 43, 183n4, 184n24, 184n25, 185n26

indigenous and traditional knowledge 145, 147, 149, 159

indigenous innovations, development of xliii

Industrial Development Corporation (IDC), South Africa 249

industrial investment xx

industrialisation path, of China 189

industrial output by sector and province, South Africa 311–12

Industrial Revolution xxx, 26

information and communication technologies (ICT) xxxvi, 39, 98, 124, 138, 174–75, 178–79, 281, 293

innovation capability, of Chinese enterprises 208

innovation system, in China: administrative bodies of 192–

93; constraints in 211; culture of 211-12; mechanism of 210 innovation systems (IS): concept of xxiv; culture of 181; economics of 2; explicit and implicit 13, 53-54, 65, 103-6, 188, 212, 277; inclusive innovation policy 182; indigenous 17, 192, 203, 208, 226-27, 230-32, 237-38; innovation strategy 14, 174, 226, 300; innovation theory, system of 19; integration between innovation policy and other policies 11; national integration of 14; systemic approach to 3

Institute for Statistical Studies and Economics of Knowledge (ISSEK) 105–6

intellectual property rights 90, 101, 123, 158, 190, 197, 208, 216, 220, 236–37; in China 226–27

International Development Research Centre (IDRC), South Africa 255–56

international tests of scholastic achievement, South Africa 314

Iron and Steel Corporation of South Africa (ISCOM) 249

Joint Initiative on Priority Skills Acquisition (JIPSA), South Africa 252–53, 291

Joint Institute for Nuclear Research 114

joint ventures xl, 241n3

Kahn, M. 281, 284 Kalam, A. P. J. Abdul 156–57 Kalyani, Baba 153 Knowledge Innovation Programme 219, 224–25 Koltsevo 114 Korolyov 114 Kothari, D. S. 143

laissez faire capitalism 17 Lastres, H. M. M. 7, 19n3, 23 - 24laws and legislations, in China's science and technology 223-24, 232 less developed countries

(LDCs) xxix Lundvall, B.-Å. 7, 20n5

macroeconomic and political stability 95 Mahalanobis, P. C. 143, 145 Mahindra, Keshub 153 Marchuk, G. 85 market-oriented economy 17 Mashelkar, R. A. 152 Medlicott, H. B. 141 Menon, M. G. K. 152 Michurinsk 114 micro and small enterprises (MSEs) 55 Ministry of Education (MOE), China 192 Ministry of Industry and Information Technology (MIIT), China 192 Ministry of Science and

Technology (MOST), China 192, 216, 220

Mittal brothers 153 Murthy, Narayana 153

NASSCOM 153, 172, 175 National Bank for Social and Economic Development (BNDES), Brazil xx, 42–44; programmes aimed at innovation 77 National Biotechnology Strategy 281 National Council on Research and Innovation 299 National Development and Reform Committee (NDRC), China 192-93, 228, 231 National High-Tech Industrial Development Zones, China 231, 236 National Key Scientific and Technological Planning (1982), China 213–14 National Knowledge Innovation System, in China 219 National Nature Science

Foundation (NNSF), China 215

National Qualifications Framework (NQF), South Africa 258, 290, 292

National Research and Development Strategy (NRDS), South Africa 267, 277, 279-83

National Science and Technology Commission, China 213

- National Science and Technology Conference (2006), Beijing 203, 219, 222, 226
- National Science Foundation Committee (NSFC), China 192
- national scientific research expense, of China 198
- national system of innovation (NSI), China 12, 88, 192, 201; analyses, levels of 212; characteristics of 206; evaluation and monitoring of 241; evolution of 188; government guidance on 240; idea at innovation process 188; Knowledge Innovation Programme 219, 224-25; local government role in 212; obstacles and constraints in 207; reform of science and technology system, tasks in 239; state policy and institutions outcomes on 233–38; state role in 206–7, 238; structural changes in 238 national system of innovation (NSI), India 16, 139; actors and agencies of 158-61; challenges with 165-66; governance structure in 161-62; government initiatives (1990-2009) 167-71; higher educational sector, role of 160-61; objectives 162-65; policy measures (1997-2009) 171-73; private business enterprises and TNCs, role of 159-60; public-private

research systems 165; public research system, role of 159; and public support to innovation 173–77; reconfiguring formal and informal sectors for 166; technological capabilities and competitiveness 166; university–industry partnerships 165

- national system of innovation (NSI), Russia 80, 82–83; impact of state policy and state institutions on 124–26 national system of innovation
- (NSI), South Africa 271–77; analyses of 271; determinants of 271; national integration of 288–89; outcomes of state policy and institutions on 294–95; recommendations on targeting improvements 295–301; state's role in evolution 249
- Nehru, Jawaharlal 139, 141–43, 145, 183n4
- Nelson, R. R. 20n5
- New Growth Path (NGP) policy 2010, South Africa 253, 301n6
- Outline of National Medium and Long-Term Science and Technology Development Plan (2006–2020), China 188, 203, 232

Patent Law, China 198, 218 patents, in China: granting of 209; registration and

classification of categories 208 - 9people-oriented concept 210 Petrobrás 25 Pitroda, Sam 152 planned economy 81, 193-95, 205-7, 210-11, 213, 218, 221, 241n2 policy: analytical models 7; development 8, 11, 17, 23-25, 61, 82, 248, 261, 274, 295, 298, 300; educational 50; evaluation and monitoring system 241; explicit and implicit policy on science, technology and innovation 13, 53-65, 103-6, 188, 212-32, 277-93; failure 18; framework 13-15, 17, 83, 92, 128, 142, 274, 278-79, 286-87, 295; industrial 30, 32, 49, 54, 59, 60, 69, 256, 278, 286, 287-88, 302n12; interactions of policy between the national and sub-national levels of government 14; macroeconomic regime and 59-60; procurement 257; recommendations 18; relationship between innovation policy and development policy 11; S&T and innovation policy 81, 103, 105–6, 122, 124, 126, 130; state policy, effects of 15, 296; taxonomies and policy prescriptions 7 poverty 253, 260, 273, 296, 298-99; Family Pension Programme (FPP), Brazil

- 62; and income inequality 274–75; in India 142, 150–
- 2/4 75; III IIIdia 142, 150-
- 51, 174; lines of extreme
- 71n18; removal of 151, 281;
- in South Africa 274–75; unemployment and 252
- Prebisch, Raúl 24
- primary industry, in China 203–4
- public-private partnership (PPP) xxxii; Biotechnology Industry Partnership Programme (BIPP) 169; development of 102; economic and market strategies of 153; in higher education 175; innovation potential 165; mechanisms of 115–17; R&D centres in 170; in science education 169; in space sector 176
- public procurement policies, in China 231–32
- public research system (PRS) 139, 158, 159, 165–67, 169, 181
- purchasing power 56, 62, 138, 174, 297
- Rajan, Y. S. 156
- Rao, P. V. Narasimha 151
- Ray, P. C. 141
- RedeSist xxiv, 52
- regional convergence, in South Africa 275–77
- regional imbalances in China, on innovation capability 191–92
- Research & Development (R&D) 70n10; application

of R&D results 81, 86; in Brazil 26; in China 199–200, 208–9, 211, 235; financing projects of 42; in India 138, 150, 158; investments in 150; mechanisms for support to 68; organisations engaged in 123; R&D centres 37, 80, 110, 160, 170; in South Africa

- 255, 259, 260, 265–67 research personnel
  - demographics, in South Africa 311–12
- Rosnano 116-17, 127
- Roy, Raja Rammohan 140
- rural science and technology innovation, development of 191–92
- Russia: Budgetary Code of the Russian Federation 119; collapse of the USSR 81, 86, 89, 104; Critical Technologies of the Russian Federation 107; defencerelated industrial complex xxxv; direct funding 118; explicit and implicit state policy towards science, technology and innovation 103-24; government support for R&D 118; indirect motivation 81; Innovation System of Russian Federation 82; institutional environment and legal regulations 124; national system of innovation in, see national system of innovation (NSI), Russia; private sector enterprises 17; regulation system 118;

'roadmap' for reforms 83; Russian Corporation for Nanotechnology (Rosnano) 116; Russian Federation's policy in S&T development 107; Russian Venture Company (RVC) 115–16; science and technology in, *see* science and technology (S&T), Russia; target indicators for NSI development 84; technoparks, science cities and special economic zones (SEZs) 112

- Russian Corporation for Nanotechnology (Rosnano) 116
- Russian Federation's policy in S&T development 107

Russian Venture Company (RVC) 115–16;

- Saha, M. N. 141, 183n2
- Sarabhai, Vikram 152

School Census and Evaluation System of Basic Education (SAEB), Brazil 65

- Schumpeter, J. 7
- science and technology (S&T), India: 1947–1970 period 142– 47; 1970–1990 period 147–51; 1991–2000 period 151–55; aggregate gross expenditure on 138; evolution phases 140–58; government support 139; national system of innovation (NSI) 139; policy discourse, 2003 156–58; Science Citation Index (SCI) and 138

science and technology institution (STI) xxvii, 5, 17, 139, 141-43, 147, 170, 282 science and technology (S&T), Russia 90-91; Budgetary Code of the Russian Federation 119; budgetary reforms 118–22; civil S&T budget 119; 'Conception of a Long-Term Development until 2020' (CLTD 2020) 82-83; 'Concept of Budgetary Process Restructuring' 120; development indicators (1990-2006) 91-95;evaluation of national policy 106; evaluation of performance of R&D organisations 111-12; explicit and implicit state policy towards 103-24; federal budget, functions of 121-22; human resources for 117–18; infrastructure for 112-15; 'Innovation-Driven Development as the Basis for Modernisation of the Russian Economy' 105; innovative nanotechnologies and nanoindustries 117; national priorities 106-8; official science city status 114; public-private partnership mechanisms 115–17; recommendations to improve 127–34; restructuring of R&D organisations 108–11; Russian Federation's policy on 82; RVC, role of 115-16;

state corporations, role of 116-17; system of innovation 95-103; taxation rules 122-24; technoparks, science cities and special economic zones (SEZs) 112-13, 112-15 science and technology (S&T), South Africa: functions to assess 264; industrial policy 287-88; inter-NSI integration 292–93; national integration of NSI 288-89; National Research and Development Strategy (NRDS) 267, 277, 279-83; public understanding and awareness 292; reformation in 1994 264; Ten Year Innovation Plan 283–86; White Paper 1996 278-79 science and technology (S&T),

USSR: 20-year period reform 88-90; 1980s 84-85; 1990s 86; in 2009 81; central planning model of 17; dissolution of 12, 17; government spending 80; and national system of innovation (NSI) 80, 82-83; non-profit private R&D sector 87; as percentage of GDP 80; period of 1999 to the middle of 2008 88; post collapse of USSR 81; R&D institutions by ownership 87; share of public R&D organisations 90; share of Russian enterprises 90; 'Soviet' R&D model 88-90; under the Soviet 'rules' 87 science city, concept of 112-15 Science Policy Research Unit

(SPRU), Sussex University 19

science, technology and innovation (STI), China 188; in 21st century 226-32; macro policy-making system and mechanism for 207; policies in 1980s 213-18; policies in 1990s 218-26 'Scientific Outlook of Development', China 192, 241n1 Scerri, M. 20n7, 249, 262, 275-77, 290 secondary industry, in China 203 - 4'separate development' model 250-51, 277 Singh, Manmohan 151, 156-58, 163, 180 single public ownership, in China 193–95 Sino-foreign cooperative enterprises 241n3 Sircar, Mahenderlal 141 small- and medium-scale enterprises (SMEs) xlv, 40, 151, 164, 166-67, 230 social inequalities 24, 50 South Africa: Accelerated and Shared Growth Initiative for South Africa (AsgiSA) 252, 287, 291, 294; African National Congress (ANC) 251; apartheid economic history 298; Council for Scientific and Industrial Research (CSIR) 260; Department of Arts, Culture, Science and Technology

(DACST) 254–56, 258–60, 277, 278, 294 Department of Basic Education 261; Department of Higher Education and Training (DHET) 261; Department of Science and Technology (DST) 253; Department of Scientific and Industrial Research (DSIR) 164, 171-72, 183; Department of Trade and Industry (DTI) 257, 259; economic history of 262-63; economic interventions, of state 250-51; GDP per capita 308; Growth, Employment and Redistribution (GEAR) 250-51, 255-56; Human Sciences Research Council (HSRC) 259-60; indigenous STI component 297; innovation policy articulation 18; International Development Research Centre (IDRC) 255–56; Joint Initiative on Priority Skills Acquisition (JIPSA) 252-53, 291; macroeconomic indicators for 308; Ministerial Review Committee 299–300; National Advisory Council on Innovation (NACI) 258; national, regional and local production and innovation structures, features of 262-64; National Research and Development Strategy (NRDS) 267, 277, 279-83; national system of innovation in, see national

system of innovation (NSI), South Africa; New Growth Path (NGP) policy in 2010 253; New Partnership for African Development (NEPAD) 292–93, 295; NRF, constitution of 258–59; periodisation and analysis of institutions and policies 254-61; political and economic isolation during apartheid 250; post-apartheid era 251-53; post-apartheid history of STI of 248; poverty in 274-75; racial capitalism 12; Reconstruction and Development Programme (RDP) 255; regional integration across sub-Saharan Africa 293; research and technology foresight exercises, establishment of 258; role in evolution of NSI 249; science and technology in, see science and technology (S&T), South Africa; science and technology system 264-70; services sector xxxvi; setting of ISCOM after World War I 249; South African Research Chairs Initiative (SARChI) 259, 294-95; specificities of innovation system and relationship with state 262-77; Technology Innovation Agency (TIA) 285; unemployment rates in 309; White Paper on Science and Technology (S&T)

policy 254-57 South African Communist Party 253 South African Research Chairs Initiative (SARChI) programme 259, 294-95 Soviet Union, see science and technology (S&T), USSR Spark Programme, in China 216 state: concept of 6; economic and social development 4; governance system 16; legal definition of 6, 10, 16; nature of 10; relationship with national systems of innovation 1–2; role of 1; science, technology and innovation (STI) policy 8; state theory 3; structural transformation of 10; systemic approach to innovation 3 State Economic and Trade Commission, China 201–2, 213-14, 222 state-owned enterprises (SOEs) 25, 191, 195, 238, 267 State Planning Commission 213 sub-national systems of innovation 8, 277 Subrahmanyam, K. 152 system crisis 87, 91

talents, patents and technology standards, in China 219–20 Tata, Ratan 153 taxation policies, in China 220–22 technological innovation policies, in China 202–3 Technology Contract Law,

China 198 technology import, in China 208 Technology Innovation Agency (TIA), South Africa: criticisms against 286; establishment of 285; objectives of 285-86 tertiary industry, in China 203-4 Theory of Economic Development xxvi 'Three capital' enterprise 195 Torch Programme, in China 216-17, 236 trade tariffs 27 transnational corporations (TNCs) xlvi, 158

underdevelopment, notion of xxxi, 23–26, 62, 179, 288 Unified Register of Social Programmes (CadÚnico), Brazil 62

Vitorino, V. 188

Vocational Technical Centres 58

White Paper on Science and Technology (S&T) policy, South Africa 254–57, 260, 278–79

World Trade Organisation (WTO) 158, 185, 256

Zjukovski 114