BRICS

NATIONAL SYSTEMS OF INNOVATION

Transnational Corporations and Local Innovation

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ROUTLEDGE

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This series of books brings together results of an intensive research programme on aspects of the National Systems of Innovation in the five BRICS countries — Brazil, Russia, India, China and South Africa. It provides a comprehensive and comparative examination of the challenges and opportunities faced by these dynamic and emerging economies. In discussing the impact of innovation with respect to economic, geopolitical, socio-cultural, institutional and technological systems, it reveals the possibilities of new development paradigms for equitable and sustainable growth.

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List of Abbreviations

AAR	Consortium comprising Alfa Group, Access Industries and Renova
ADR/GDR	American Depositary Receipts/Global Depositary Receipts
AGOA	African Growth and Opportunity Act
AMBEV	America's Beverage Company (Companhia de Bebidas das Américas)
AMO ZIL	automobile plant ZIL (Avtomobilnoe Moskovskoe Obshchestvo – Zavod Imeni Likhachova)
AMR	Alcoa Metallurg Rus
APDP	the Automotive Production and Development Programme
AsgiSA	Accelerated and Shared Growth Initiative for South Africa
ATMS	Advanced Technology Manufacturing Strategy
BACEN	Central Bank of Brazil (Banco Central do Brasil)
BASIC	Brazil, South Africa, India, and China
BAT	British American Tobacco
B-BBEE	broad-based black economic empowerment
BCB	Central Bank of Brazil (Banco Central do Brasil)
BEA	Bureau of Economic Analysis
BEE	Black Economic Empowerment
BERD	business expenditure on R&D
BMPA	Belokalitvinsky Metallurgical Production Association
BNDES	Brazilian Development Bank (Banco Nacional de Desenvolvimento Econômico e Social)
BNDESPar	Brazilian Development Bank Participations (BNDES Participações)
BP	British Petroleum
BPO	business process outsourcing
BRICS	Brazil, Russia, India, China, and South Africa
CARG	compound annual rate of growth
CBFI	Consultative Board on Foreign Investment

CBU	completely built unit
CDIAC-UN	Carbon Dioxide Information Analysis Center–United Nations
CEMIG	Minas Gerais Energy Company (Companhia Energética de Minas Gerais)
CGEE	Center for Management and Strategic Studies (Centro de Gestão e Estudos Estratégicos)
CIP	Critical Infrastructure Facility
CIS	Commonwealth of Independent States
CISCO	Cisco Systems, Inc.
CITIC	China International Trust and Investment Company
CJV	contractual joint venture
CKD	completely knocked down
CMIEC	China Metallurgical Import and Export Corporation
CNOOC	China National Offshore Oil Corporation
CNPC	China National Petroleum Corporation
CNPq	National Council for Scientific and Technological Development
COFCO	COFCO Corporation
COSCO	China Ocean Shipping Group Co.
CPqD	Research and Development Center for Telecomunications (Centro de Pesquisa e Desenvolvimento em Telecomunicações)
CSIR	Council for Scientific and Industrial Research
CSN	Brazilian Steel Company (Companhia Siderúrgica Nacional)
CUTRALE	Cutrale Citrus Juices
CVRD	Vale do Rio Doce Company (Companhia Vale do Rio Doce)
DE	domestic enterprises
DfID	Department for International Development
DIPP	Department of Industrial Promotion and Policy
DSIR	Department of Scientific and Industrial Research
DST	Department of Science and Technology
dti	Department of Trade and Industry
ECLAC	Economic Commission for Latin America and the Caribbean
EE	electrical and electronics
EJV	equity joint venture
EOG	Exxon Oil and Gas Ltd

EPO	European Patent Office
ESF	Elbe-Stahlwerke Feralpi GmbH
ETN	Eaton Corp PLC
EU	European Union
FDI	foreign direct investment
FDIC	Foreign Direct Investment Company
FE	foreign enterprises
FEMA	Foreign Exchange Management Act
FERA	Foreign Exchange Regulation Act
FIAC	Foreign Investment Advisory Council
FIG	Foreign Investment Grant
FII	Foreign Institutional Investor
FINEP	Studies and Projects Finance Organization (Financiadora de Estudos e Projetos)
FIPB	Foreign Investment Promotion Board
FPS	Foreign Promoter Share
GDP	gross domestic product
GE	General Electric
GEAR	Growth, Employment and Redistribution
GERD	gross expenditure on research and development
GFCF	gross fixed capital formation
GM	General Motors
GPINs	global production and innovation networks
HEI	higher education institution
HHI	Herfindahl–Hirschman Index
HP	Hewlett-Packard
HRST	human resources in science and technology
HSE	Higher School of Economics
HSRC	Human Sciences Research Council
IBGE	Brazilian Institute of Geography and Statistics (Instituto Brasileiro de Geografia e Estatística)
IBM	International Business Machines Corporation
IBSA	India, Brazil and South Africa
ICT	information and communication technology
IDP	investment development path
IDZ	Industrial Development Zone
IEDI	Institute for Studies in Industrial Development (Instituto de Estudos para o Desenvolvimento Industrial)
IEG	Institute of Economic Growth
IHI Corp.	Ishikawajima-Harima Heavy Industries Co., Ltd.

IISc	Indian Institute of Science
IIT	Indian Institute of Technology
INPI	National Institute of Industrial Property (Brazil)
INRIA	National Institute for Research in Computer Science and Control (Institut National de Recherche en Informatique et en Automatique)
INTEL	Intel Corporation
IP	intellectual property
IPAP	Industrial Policy Action Plan
IPEA	Institute for Applied Economic Research (Instituto de Pesquisa Econômica Aplicada)
IPR	intellectual property rights
IRL	India Research Laboratory (IBM)
ISIC	International Standard Industrial Classification
ISO	International Organization for Standardization
ISS	International Space Station
ISSEK	Institute for Statistical Studies and Economics of Knowledge.
IT	information technology
ITC	International Trade Centre
JSE	Johannesburg Stock Exchange
JV	joint venture
LDCs	less developed countries
LG	LG Electronics
LNG	liquefied natural gas
LSE	London Stock Exchange
M&A	mergers and acquisitions
M&M	Mahindra and Mahindra
MBA	Master of Business Administration
MIDP	Motor Industry Development Programme
MIPT	Moscow Institute of Physics and Technology
MMX	Mineração e Metálicos
MNC	multinational corporation
MNE	multinational enterprise
MOFTEC	Ministry of Foreign Trade and Economic Cooperation
MoU	Memorandum of Understanding
MSF	Doctors Without Borders (Médecins Sans Frontières)
MSU	Lomonosov Moscow State University
MUV	multi-utility vehicle
NACI	National Advisory Council on Innovation

NASDAQ	National Association of Securities Dealers Automated Quotations
NASSCOM	National Association of Software and Services Companies
NBFCs	non-banking financial companies
NBS	National Bureau of Statistics of China
NCAER	National Council of Applied Economic Research
NCEs	new chemical entities
NDDS	Nipissing District Developmental Screen
NDDS	new drug delivery system
NDP	National Development Plan
NIS	National Innovation System
NISTADS	National Institute of Science, Technology and Development Studies
NPC	National Planning Commission
NRI	non-resident Indian
NSI	National System of Innovation
OECD	Organisation for Economic Co-operation and Development
OEM	original equipment manufacturer
OFDI	outward foreign direct investment
OGL	open general licence
OMZ	United Heavy Machinery
ONAKO	Orenburg Oil Company
ONERA	The French Aerospace Lab
PBG	Pepsi Bottling Group
PC	parent company
PCD	Personal Computing Division (IBM)
PCT	Patent Co-operation Treaty
PE	private equity
PID	Programme of Innovation Development
PINTEC	Brazilian Survey on Technological Innovation/ Brazilian Innovation Survey
PUC	paid-up capital
QRs	quantitative restrictions
R&D	research and development
RAS	Russian Academy of Sciences
RBI	Reserve Bank of India
RF	Russian Federation
RFBR	Russian Foundation for Basic Research

RFTR	Russian Foundation for Technological Development
RTFP	Regional Trade Facilitation Programme
RUSNANO	Russian Corporation of Nanotechnologies
RVC	Russian Venture Company, Inc.
S&T	science and technology
SA	South Africa
SADC	Southern African Development Community
SANAS	South African National Accreditation System
SARB	South African Reserve Bank
SEZ	special economic zone
SI	system of innovation
SIAM	Society of Indian Automobile Manufacturers
SKD	semi-knocked down
SIDANKO	AO Siberian Far-Eastern Oil Co
SME	small- and medium-scale enterprise
SMEDP	Small and Medium Enterprise Development Programme
SMMEs	small, micro and medium enterprises
SMZ	Samara Metallurgical Plant
SPE	Special Purpose Entity
SRA	Strategic Research Agenda
SSP	Skills Support Programme
STI	science, technology and innovation
TAM	TAM Airlines
TC	technological capabilities
TFP	total factor productivity
THRIP	Technology and Human Resources for Industry Programme
TINA	there is no alternative
TIPS	Trade and Industrial Policy Strategies
TISA	Trade and Investment South Africa
TNC	transnational corporation
TNK-BP	Tyumen Oil Company-British Petroleum
TP	Technology Platform
TRIPS	Trade Related Aspects of Intellectual Property Rights
TsAGI	Central Aerohydrodynamic Institute
UAC	United Aircraft Corporation
UBM	Ural Boeing Manufacturing
UFMG	Federal University of Minas Gerais (Universidade

	Federal de Minas Gerais)
UFRJ	Federal University of Rio de Janeiro (Universidade Federal do Rio de Janeiro)
UNCTAD	United Nations Conference on Trade and Development
UOP	Universal Oil Products
USPTO	US Patent and Trademark Office
USSR	Union of Soviet Socialist Republics
UTC	United Technologies Corporation
VC	venture capital
VCP	Votorantin Pulp and Paper (Votorantim Papel e Celulose)
VSMPO	Verkhnaya Salda Metallurgical Production Association
WFOE	wholly foreign-owned enterprise
WTO	World Trade Organization

Foreword

This is a timely book on an important subject, namely, the effects of foreign direct investment (FDI) and the operations of transnational corporations (TNCs) on the innovation systems of host countries, in the case of this book, the BRICS countries. The five country case studies provide abundant material, which the introductory chapter starts to synthesise. The emergence of the BRICS countries has already changed deeply the economic and political configuration of the world and it will do so increasingly. However, in the area of science, technology and innovation (STI), a gap remains with the advanced industrialised countries. On account of the course taken by the historical development of the world economic and political system, notably since the 18th century, these countries possess highly-developed innovation systems. They also remain by far the main source of FDI and are home to the large majority of TNCs. Only Japan in the 1960s and Korea in the 1980s succeeded in rejoining in these respects the industrialised countries of the North Atlantic.

Before coming to the current objectives of FDI and the technology-related strategies of TNCs, it may be useful to recall the recent and present economic context and the specific constraints under which those seated in the industrialised countries of the North Atlantic are operating. This can help to understand the way they approach their operations in host countries. Since the 1990s, the setting of FDI has been that of a long term slowdown in the rate of growth and the rate of investment of Organisation for Economic Co-operation and Development (OECD) countries as well as of changes in capital ownership leading to contemporary 'corporate governance' and the rule of shareholder value maximisation. In the United States, the change in ownership favoured large institutional financial investors and has given an important say to financial fund managers in corporate policy. In Europe, change came through the extensive privatisation of corporations previously publicly owned and government controlled. Increasingly, the operations of quoted corporations have been subservient to the imperatives of shareholder value maximisation. The 1990s also saw the growth of public and then of consumer and mortgage

debt and thus the rise of interest-based financial income. In toto, the story, from the early 1990s on, has been one of growth of dividend and interest income at the expense of reinvested profit and, most of all, at that of the salaries earned by the overwhelming majority of employees and workers, including those engaged in engineering or in research activities. The primacy of financial accumulation and a top heavy financial system triggered off a string of currency and financial market crises which began in the periphery before moving in 2001, with the dotcom crash on NASDAQ to the heart of the system. The accentuated recourse to debt-led growth after 2002 fuelled a housing and construction boom itself artificially supported by the fabrication and marketing of evermore sophisticated but finally worthless securitised assets until the whole macroeconomic and financial configuration ran into the wall in 2007.

The world economy taken as a whole has not yet emerged from the global economic and financial crisis triggered off in August 2007 by the international contagion of the United States' mortgage-backed asset market collapse. The subprime junk asset crisis transformed itself in 2008 into a dramatic liquidity and solvency crisis of major Wall Street financial institutions that threatened to pull down the entire world financial system and led to a sharp fall in world trade and employment. Some countries, notably BRICS, managed to weather off the 2009 recession successfully. Nonetheless, to differing degrees they have finally all experienced its very negative impacts. With regards to the industrialised countries, nearly six years after the start of the subprime debacle, the United States, which stood at the epicenter of the crisis and was the initial seat of the world recession, and the member countries of the European Union (EU) and in particular the Eurozone which bore the brunt of its impact, are still experiencing either very slow growth or outright recession. The reason for this, put in a nutshell, is the clinging-on by these countries to the finance-dominated accumulation regime and hence the priority given to creditors and rentiers and the restoration of debt-led growth. In the EU countries with particularly high levels of public debt, governments have chosen (the United Kingdom), or been forced (the Southern, Balkan and Baltic EU countries) to enact 'shock strategy' austerity policies.

In this context of low growth and quasi-recession, TNCs can only satisfy shareholders and help keep stock markets remain reasonably buoyant they must globalise more than ever their operations outside

the OECD. Thus, in 2012 China and Brazil were respectively the first and third recipients of total world FDI. FDI can be seen as pursuing three main types of objectives: access to and control of natural resources, notably minerals; access to markets; finally, access to productive assets of different types. In industries where host countries have started building scientific and technological capacities in given sectors, their access will be targeted through acquisitions and mergers (TNCs' preferred route) or otherwise through joint ventures. However, today, perhaps the most prized productive asset targeted by TNCs are educated and skilled personnel, be they on-site workers, engineers or researchers available for employment at lower and often much lower salary levels than in TNCs' home countries. In the context of financialisation, productive-asset seeking FDI targeting human resources has taken the form of export-oriented offshoring and outsourcing.

Within this breakdown of FDI objectives, innovation-related investments and research and development (R&D) outlays made by TNCs are of two types. The first are the ones considered necessary for properly satisfying domestic demand in a context of strong global–local oligopolistic rivalry with other TNCs and possibly of competition with host-country domestic firms to the extent that these are allowed and helped to grow in size and increase their own technological competence. R&D aimed at adapting products or processes to local conditions may provide knowledge that TNCs can then diffuse with their global group structures. The second outlays are those where TNCs aim at maximising the benefits of offshoring by integrating local technological assets into their global corporate R&D network. The enhancement of host country National Systems of Innovation (NSIs) has never been a concern of TNCs. It is established that when their presence is not overwhelming, they can spur domestic firms' efforts to improve technological competencies. But otherwise, as the country studies in this book show quite well and as the introductory chapter stresses in its final sections, concerted measures by host governments and domestic firms are required for maximising the possible contribution of TNCs to the strengthening of the National System of Innovation as well as for offsetting possible negative effects of their presence such as crowding out and monopolising demand for very skilled personnel. The use by host countries of all available political and legal devices available in order to protect

strategic industries, just as many of the industrialised countries do, is only legitimate national behaviour. It can also represent the general interest of the majority of the people of our planet. This is why I hail the decision just made by the Supreme Court of India against a major pharmaceutical TNC. This ruling defends genetic drug production and raises a barrier against the spurious patenting of products with exactly the same therapeutic properties.

France
April 2013

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Preface

This series is the result of a collaborative effort of several people and institutions. The contributions presented here consolidate the findings of the project 'Comparative Study of the National Innovation Systems of BRICS' sponsored by the International Development Research Centre (IDRC). The project is rooted in a larger research effort on BRICS National Innovation Systems being developed in the sphere of the Global Research Network for Learning, Innovation and Competence Building Systems — Globelics. The Globelics initiative on BRICS brings together universities and other research institutions from Brazil, Russia, India, China, and South Africa. It seeks to strengthen an original and less dependent thought, more appropriate to understanding development processes in less developed countries.

First and foremost, we would like to thank Professor Bengt-Åke Lundvall, the coordinator of Globelics, who supported and promoted the BRICS project from the outset in 2003 and organised the First International Workshop of the BRICS Project in Aalborg, Denmark, in 2006. Without his leadership and enthusiasm the project could not have taken off.

We owe special thanks to project researchers and coordinators for their engagement in project activities and accessibility which helped overcome difficulties that naturally emerge from the geographical and cultural diversity of BRICS. We are also very grateful to the ones who provided the necessary administrative and secretarial support allowing the good performance of the project, especially Luiza Martins, Fabiane da Costa Morais, Tatiane da Costa Morais, and Eliane Alves who helped in editing activities and whose support was crucial for formatting book manuscripts and organising tables and figures. Max dos Santos provided the technical IT support for the research network.

The core ideas analysed in this series were discussed at international seminars organised in Brazil (2007), South Africa (2008), India (2009), and Brazil (2009) under the auspices of the BRICS Project, gathering scholars, academics, policy makers, businessmen, and civil society representatives. Our understanding of this complex theme has

evolved considerably thanks to constructive criticism from the seminar participants. We are grateful to them as well as to all other people not named here who also helped in the implementation of the project.

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